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An Analysis Of Underlying Competencies And Computer And Information Technology Learning Objectives For Business Analysis

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AN ANALYSIS OF UNDERLYING COMPETENCIES AND COMPUTER AND INFORMATION TECHNOLOGY LEARNING OBJECTIVES FOR BUSINESS ANALYSIS

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LIST OF ABBREVIATIONS

ACM	Association for Computing Machinery
BA	Business Analyst
BPMN	Business Process Modeling Notation
CBAP	Certified Business Analysis Professional
CIT	Computer and Information Technology
CNIT	Computer and Information Technology
IIBA	International Institute of Business Analysis
IS	Information Systems
IT	Information Technology
LO	Learning Objective
MIS	Management Information System

GLOSSARY

Agile Software Development – development methodologies that emphasize, "close collaboration between the programmer team and business experts; face-to-face communication (as more efficient than written documentation); frequent delivery of new deployable business value; tight, self-organizing teams; and ways to craft the code and the team such that the inevitable requirements churn was not a crisis" ("What is agile," n.d., para. 1)

Business Analysis – "the set of tasks and techniques used to work as a liaison among stakeholders to understand the structure, policies, and operations of an organization, and recommend solutions that enable the organization to achieve its goals" (Barret, n.d., p. 2)

Business Model – "…a simple representation of the complex reality of a business. The primary purpose of a business model is to communicate something about the business to other people: employees, customers, partners, or suppliers" (Bridgeland & Zahavi, 2008, p. 1)

Business Intelligence – "applications, platforms, tools, and technologies that support the process of exploring business data, data relationships, and trends" (Raisinghani, 2004, p. x)

Business Process – "a set of organized activities and work to carry out specific defined functions" (Lientz & Rea, 2004, p. 17)

Business Rules – "formal, defined directions for what to do with the input to the process" (Lientz & Rea, 2004, p. 18)

Information System – "Arrangement of people, data, processes, information presentation, and information technology that interact to support and

improve day-to-day operations in a business as well as support the problem-solving and decision-making needs of management and users" (Whitten, Bentley, & Dittman, 2001, p. 707)

Information Technology – "Contemporary term that describes the combinations of computer technology (hardware and software) with telecommunications technology (data, image, and voice networks)" (Whitten, Bentley, & Dittman, 2001, p. 707)

Systems Analysis – "a problem-solving technique that decomposes a system into its component pieces for the purpose of studying how well those component parts work and interact to accomplish their purpose" (Whitten, Bentley, & Dittman, 2001, p. 720)

ABSTRACT

Quigley, Ryan. M.S., Purdue University, December 2013. An Analysis of Underlying Competencies and Computer and Information Technology Learning Objectives for Business Analysis. Major Professor: Kevin Dittman.

This research examines whether the Computer and Information Technology (CIT) department at Purdue University should develop a business analyst concentration. The differences between system and business analysts, evolution of the business analyst profession, job demand and trends, and applicable model curricula were explored to support this research. Review of relevant literature regarding the topics suggested that a business analyst concentration should be developed. A gap analysis was performed to determine how well selected CIT courses address the skills and competencies required by today's business analysts. The primary finding, as a result of the analysis, was that CIT courses alone are not able to fulfill all of the learning objectives necessary for a business analyst. Based on this finding multiple recommendations are made, including a proposed business analyst concentration plan of study.

CHAPTER 1. INTRODUCTION

This chapter will provide an overview on the research project and its significance. The research question, scope, significance, and definitions will each be addressed. The chapter will also include the research assumptions, limitations, and delimitations.

1.1 Research Question

Should a business analyst concentration be developed for the Computer and Information Technology (CIT) curriculum at Purdue University to provide undergraduate students the knowledge and skills for a successful career in the emerging business analysis discipline? If so, how might a proposed business concentration be developed?

1.2 Scope

Higher education in the field of information technology (IT) is often based heavily on various model curricula. These curricula help academic programs determine which courses are needed, along with the learning outcomes that define the skills students should have when they graduate from the program. One of the toughest challenges facing IT higher education is recognizing trends

in the industry, and in turn adapting their course offerings to meet the needs and expectations of the job opportunities in the field. Due to these challenges, among others, the researcher posed the question, should a business analyst concentration be developed for the CIT curriculum for Purdue University to provide undergraduate students the knowledge and skills for a successful career in the emerging business analysis discipline? Subsequently, if a business analyst concentration should be developed, how might a proposed business analyst concentration be created?

Given the research question presented above, it was necessary to define the scope within which the researcher attempted to answer the question. Determining the scope of this research required an investigation as to what resources were best suited to aid in the pursuit of the end goal. After an initial overview of the available resources, a decision was made to concentrate on a few select data sources. The primary data sources included the International Institute of Business Analysis® (IIBA®), the *IT 2008 Curriculum Guidelines for Undergraduate Programs in Information Technology*, the *IS 2010 Curriculum Guidelines for Undergraduate Programs in Information Systems*, and finally the CIT course catalogue containing course descriptions and learning objectives for all currently offered courses.

Analysis of the aforementioned data sources enabled the researcher to develop and present recommendations for the CIT department. These recommendations are presented in Chapter 5. The recommendations and

findings of this study will help the CIT department prepare undergraduate students who wish to become business analysts.

1.3 Significance

An individual's education and expertise have become increasingly important to their marketability as a job candidate, due to the current state of the job market and unemployment. Lombardi (2012) discussing the challenges of business analyst recruiting stated, "Interestingly, Business Analysts seem to be in demand across the organization…While demand has grown for this talent, the available supply of potential qualified candidates hasn't increased at the same rate" (para. 2 & 4). This is especially important when considering the nature of the IT related disciplines. The rapid evolution of technology ultimately demands more and more from current practitioners, and will demand the same of future practitioners as well. With the current trends observed in the IT industry in terms of emergence of business analysis related positions, having the ability to prepare students to effectively take on real-world projects directly out of college becomes ever more important. The growth of the IIBA® supports this emergence and growth of the business analyst profession. In roughly a three year timespan, between February 2010 and February 2013, the IIBA®'s membership increased 124.3% totaling 26,860 members ("Dashboard", 2013; "BA Connection", 2010, p.3). Such a large increase acknowledges the growing level of attention that is being given to business analysis.

One of the primary challenges for academia, within the realm of IT, remains working to keep its course offerings current with respect to the expectations of companies and their recruiters. Lagging course offerings presents a significant issue to students pursuing a degree in the fast-paced technology field (Bullen et al., 2009, p. 136). It is important to establish a curriculum that can recognize trends in the industry, such as the interest in the field of business analysis, so that graduates can be better positioned to enter the market.

Traditionally in IT, requirements definition, design, and certain aspects of system implementation were the responsibility of a system analyst. An individual with this role was responsible for both the functional and technical knowledge necessary to complete an IT project. However, IT projects in companies today are becoming increasingly complex, and thus the role of a business analyst has emerged in recent years. The business analyst role has, in a sense, taken over some of the traditional responsibilities of the system analyst that were more focused on the business-side implications (Vongsavanh & Campbell, 2008, p. 1062). The increasing prevalence of the business analyst role within today's organizations should cause educators in IT-related departments to question whether revisions to current curricula are necessary to provide students with the skills necessary to be a successful business analyst. Current systems analysis and design curricula should be examined to determine whether the skillsets needed by business analysts are being appropriately addressed or not.

The issues discussed above represent significant problems to IT curricula within higher education institutions. The research conducted as part of this study directly addresses these problems to determine if action needs to be taken within Purdue University's CIT department to formally create a business analyst curriculum. The significance of this study itself lies in the identification of key learning objectives that must be met in order to deliver a business analyst concentration. Additionally, both a gap analysis and alignment of those learning objectives with current CIT courses was performed. Through this, a more comprehensive picture has been produced, showing CIT faculty a model of what a potential business analyst concentration might look like. This will hopefully initiate a discussion within the CIT department to consider further development of such a concentration in the near future. Additionally, identification of learning objectives for future business analyst provides opportunities to improve current course offerings prior to the official creation of a unique concentration. This is important due to the significant time and effort it takes to officially release a revision to one of the multiple model curricula that are utilized by the CIT department. For example, the *IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems* represents a revision of the previous version released that dates back to 2002 (Topi et al., 2010, p. v). In the opinion of the researcher, an 8 year revision cycle for an IS model curriculum is far too long. The rate of change in the IT industry suggest that a much shorter revision cycle should be adopted by the professional organizations that author the various model curricula. This research aims to enable noteworthy additions to be

incorporated into CIT courses sooner rather than later. It should be noted that all of the recommendations and analysis presented by the researcher have been validated by professors who each have worked in the technology industry for more than 10 years, and select members of the Industry Advisory Board for the CIT department at Purdue University.

1.4 Assumptions

Assumptions play an important part of this study by providing the foundation for which it is conducted. The following assumptions for this research have been identified:

- The competencies and skills needed for business analysis as defined by the IIBA® are well accepted by practitioners in industry
- There is a difference between the skillset needed for a system analyst and a business analyst
- Data acquired from the CIT department regarding course learning objectives will be complete and up-to-date
- Review and approval of this research by faculty members with industry experience and select IIBA® members will be sufficient to label the suggestions and findings of this study as relevant

1.5 Limitations

Limitations play an important part of this study by further refining the scope of the research. The following limitations have been identified:

- Given the qualitative nature of this study, the researcher's bias in the sample selection and learning objective mapping, is inherent throughout the research
- Determination of the learning objectives for current CIT courses was based solely on documentation provided by the department
- Mapping of learning objectives for the gap analysis was based on the learning objectives present in the information obtained by the researcher, not the topics and materials covered in each course
- The competencies and skills identified by the IIBA® for use in this research reflect the current point in time, and thus may change in the future
- There are many different views of what the role of a business analyst comprises of, thus this research will focus primarily on the role of the business analyst as outlined by the International Institute of Business Analysis® (IIBA)

1.6 Delimitations

Delimitations play an important role in this study by specifically stating what will not be addressed in this research. The following delimitations have been identified:

- It was not the intention of this research to evaluate all of the course objectives by courses offered at Purdue University outside of the CIT department; however, it was necessary to evaluate courses in other departments as determined during the course of the research to make practical recommendations
- Graduate-level courses offered as part of the CIT curriculum were not examined in the initial analysis, however these courses may play a role in the final recommendations
- The recommendations and conclusions presented as a result of this research, are proposed independently without regard to their level of adherence to university policy
- This research will not be applicable outside of Purdue University due to analysis based on the university's course offerings
- The researcher did not attempt to design any courses to address the competencies identified through the research
- It was not the intention of this research to identify specific courses or learning objectives for the concentration based on industry, specialization, interest, etc., to provide multiple paths through the proposed business analyst curriculum

1.7 Chapter Summary

This chapter presented the scope of the research topic for this thesis. The significance of the proposed research question was also discussed. Additionally, important definitions, assumptions, limitations, and delimitations necessary to understand the basis for this study were introduced.

CHAPTER 2. REVIEW OF RELEVANT LITERATURE

The scope of this literature review encompasses multiple topics that contribute to the validity of the research question. In order to effectively address and build a case for this research, the researcher needed to review articles related to business analysis, business analysts, systems analysis, systems analysts, job data and projections, and IT and IS curricula. Given the unique scope and focus of the research question, there were no related studies directed at distinguishing system analysts and business analysts for the purposes of academic curricula. However, there was a large sample of literature addressing the various topics influencing the legitimacy of this study. Based on this finding, the researcher chose to concentrate largely on articles analyzing the business analyst profession, focusing mainly on its history, trends, demand, and importance. It was also important to uncover literature on system analysis and system analysts in order to support the primary assumption that there is a difference between a system analyst and a business analyst. These articles helped form and support the underlying foundation needed to address the research question. Additionally, research regarding certification as well as both current and projected job demand provided a more complete picture of the state of the discipline quantitatively. Articles selected to be reviewed for the

subsequent literature review were chosen based on the quality of the source and relevance to the research question as determined by the researcher. The result was a collection of articles pertaining to business analysis that illustrate the need for a concentration to be proposed for the CIT program. Next, the search areas utilized to collect the articles will be discussed.

2.1 Search Areas for Literature Review

A thorough search of Purdue University's library resources, Google Scholar, and websites of professional organizations resulted in the final collection of literature. These resources included 467 databases covering a multitude of categories ranging from arts and humanities, to engineering and technology. Given the topic and area of research, certain databases were utilized more than others to search for relevant and meaningful articles. The principal databases used were Academic Search Premier (EBSCO), ProQuest Research Library, Applied Science and Technology, Business Source Premier, and ScienceDirect among others. From the pool of databases available, the researcher created two groups of databases that he deemed directly related to the field of IT. Using these created database groupings, the researcher was then able to more effectively focus searches to obtain higher quality results. As a secondary means of searching for articles, Google Scholar was also used. In addition, websites representing professional organizations, such as the IIBA® and ACM, were accessed to collect publications for review. When using the aforementioned search tools a collection of keywords and phrases were used to limit the search

results. The main keywords and phrases used were ‘business analysis’, ‘business analyst, ‘business analyst trends, ‘business analyst demand’, ‘business analyst role, ‘system analyst’, ‘system analysis’, ‘IT model curricula’, ‘IS model curricula’, and ‘IT workforce trends’.

The articles chosen for review were obtained from a number of reputable sources. These sources included Forrester, the *Communications of the Association for Information Systems*, and the IIBA®. There are also two magazines represented in the literature review, *IT Professional* and *CIO*. The remainder of this literature review will summarize the researcher’s findings topically covering an overview of the system analyst discipline, differences between a system and business analyst, the business analyst discipline, business analyst job importance and demand, and finally curriculum considerations.

2.2 An Overview of the System Analyst Discipline

The role of the system analyst must be examined in order to effectively address the research question presented by this paper. Many universities offer curriculums focused around systems analysis and design, including Purdue University’s CIT department. As a precursor to the main goal of this research, evidence must be provided that there is indeed a difference between the role of the system analyst and the business analyst. This section will be used to lay the foundation for the subsequent section, where the differences between the roles and skills of a business analyst versus a system analyst will directly be discussed.

One of the challenges analyzing the discipline of systems analysis is that there are numerous definitions of the role. Misic and Graf (2004) suggest that there may be, “almost as many definitions as there are job openings for system analysts” (p. 32). The researcher has chosen to use the following definition of system analysis for the purposes of this paper, “a problem-solving technique that decomposes a system into its component pieces for the purpose of studying how well those component parts work and interact to accomplish their purpose” (Whitten et al., 2001, p. 720). It is assumed that a system analyst is a practitioner of system analysis as defined above.

The system analyst has historically focused on the more technical aspects of an IT project. In Weinberg’s 1982 book *Rethinking Systems Analysis and Design,* he writes about how systems analysis had evolved:

> Systems analysis is a new wine in an old bottle. In the early days, a few decades ago, the analyst’s job was converting existing systems to new technologies. For that task, the title of ‘analyst’ was reasonably appropriate, but now the situation has changed. Today’s analyst still converts and refines existing systems, but increasingly the job is to apply technology to do new things-things that the previous systems never dreamed of. (p. 3)

The quotation above provides a brief glimpse at what system analyst activities consisted of prior, and up to, 1982. Going father back in time, Lord (1983) described the beginnings of the system analyst role. He notes that the role of the system analyst came in to existence right around the time of the first computers. The individuals who filled these initial roles were primarily programmers and developers who wrote applications. Standards and procedures people, whose focus had previously been the automation and definition of

processes, also were among the first individuals who attempted to fill the role of the system analyst (p. 394). Lord (1983) notes that programmers and developers, as well as the standards and procedures personnel, failed to meet the needs of the system analyst role. The programmers and developers failed because the end results often “failed to interface with users” (p.394). Standards and procedures people were required to dedicate the majority of their time to data processing and hardware considerations, resulting in little time to truly focus on system analysis and design activities (p. 395). Given the challenges faced by organizations to successfully conduct systems analysis and design, companies began looking for other candidates to fill the positions. Organizations began to hire “college-educated business majors” in an attempt to solve the problem of system analysis and design activities failing to meet the needs of the customer. However, Lord (1983) claims that this did not solve the problem and issues continued to persist (p. 395). The early days of system analysts were very difficult based on Lord’s overview of the challenges that organizations faced to find the personnel with the right education and skill set to fill the role. It seems that the major hurdle that organizations were faced with at the time was finding an individual with the right technical background and educational foundation to help successfully implement a system, yet still understand the business enough to ensure that the stakeholder’s needs were being met. The researcher believes that these issues have led to the evolution of the business analyst role, as supported by the literature.

Misic and Graf, in their 2004 study, sought to determine whether the activities of the system analyst had changed. Based on surveys conducted in the 1990s, system analyst activities mainly consisted of structured analysis and traditional systems development life cycle tasks (Misic & Graf, 2004, p. 32). As of 2001, the top ten activities that systems analysts performed were as followings: define scope and objectives for systems/projects, define new system requirements, review MIS plans and scope, determine impact of new system requirements, evaluate new systems against user requirements, prepare for and conduct interviews with users, analyze existing systems, write and debug computer applications, develop standards and guidelines for system development, and develop, design, and implement databases (Misic & Graf, 2004, p. 34). It can be seen in this list that there are a number of very technical skills that the study indicated were important to the role of the system analyst.

Whitten, Bentley, and Dittman (2001), describe similar skills required by system analysts in their book *Systems Analysis and Design Methods.* The authors claim that, “The systems analyst is an agent of change. He or she is responsible for showing end-users and management how new technologies can benefit their business and its operations.” (Whitten et al., 2001, p. 24). Other skills identified that a system analyst should have were: some level of computer programming expertise, general business knowledge, ability to break down a problem into its parts, interpersonal communications skills, and interpersonal relations skills (p.24-26).

As time has progressed, so has the role of the system analyst. Literature on the subject describes a skill set that has evolved over time due to changing needs of organizations and customer expectations. System analysts began converting and automating information systems (Weinberg, 1982, p. 3). The role now includes a greater focus on determining the impact of an information system and technical activities related to software design and implementation (Misic & Graf, 2004, p. 34). Today's information systems are considered substantially more complex compared to those present in the early days of the system analyst role, mainly due to the advancement of technology and the interaction between multiple systems and entities. This level of complexity has made it increasingly difficult for a single individual to possess the knowledge required to both deeply understand the business, as well as the technical prowess to be able to implement a system. Considering the complexity and interaction of today's information systems with both internal and external business entities, it is becoming unreasonable to expect someone to be deeply versed in both functional and technical knowledge. The subsequent section will address the similarities and differences between the system analyst and business analyst.

2.3 Differentiating a System Analyst from a Business Analyst

The CIT department at Purdue University places a great deal of focus on the discipline of systems analysis in many of the courses offered. One of the obstacles in pursuing the research question in this paper, involves differentiating

between the role and skills needed by a system analyst versus a business analyst.

Vongsavanh and Campbell (2008) provide an excellent comparison of the two disciplines. Their investigation was aimed at determining what the roles and skill sets were for both systems analysts and business analysts. In their research they discovered a number of roles and skills that the two professions needed to do their jobs. These roles are represented in Table 2.1 below (Vongsavanh & Campbell, 2008, pp. 1060-1062).

Table 2.1 Roles of system and business analysts

Discipline	Roles Involved
Business Analyst	Mediation Requirements Elicitation Solution Design (Business function/process) Business Modeling Business Problem Analysis IS Strategy Evaluation
System Analyst	Mediation Requirements Elicitation Solution Designer (Business function/process) Solution Implementer System Maintenance Business Process Improvement IS Standards Regulator

It can be observed from Table 2.1 that there is indeed a certain level of overlap in the roles of mediation, requirements elicitation, and solution designer.

It should also be noted that the roles of the business analyst are much more focused on business aspects and concerns, while the system analyst's roles are directed more to IT specific functions. Based on the unique roles identified for the system analyst, the researcher disagrees with Vonsavanh and Campbell (2008) regarding the role of business process improvement. Based on the literature reviewed covering the business analyst discipline in the subsequent section 2.4, it would suggest that the business analyst would also be involved in this role. While the system analyst may too be involved in the business process improvement effort, such a role should not be considered unique to system analysts. Next, the unique roles of the business analyst will be examined further.

Business modeling is one of the roles that is highlighted for the business analyst discipline in Table 2.1. Business modeling is defined as, "…a simple representation of the complex reality of a business. The primary purpose of a business model is to communicate something about the business to other people: employees, customers, partners, or suppliers" (Bridgeland & Zahavi, 2008, p. 1). This definition highlights the need for business analysts to have a great deal of knowledge about the business and how it functions. An example of a notation used for business modeling is the business process modeling notation (BPMN). White (2004) describes the main goal of BPMN as to:

> "…to provide a notation that is readily understandable by all business users, from the business analysts who create the initial drafts of the processes, to the technical developers responsible for implementing the technology that will perform the processes, and finally to the business people who will manage and monitor those processes" (p. 1)

The requirement for business analysts to have this knowledge further supports the assumption that there is a difference between a business and system analyst. Using a notation such as BPMN can provide a powerful means for business analysts to perform their roles acting as a liaison between the functional and technical side of the business.

Business problem analysis is closely related to business modeling. Having the ability to model different aspects of the business is one piece of the business analyst role. However, the job of the business analyst does not stop here. The business analyst must be able to understand what the model represents, and be able to determine if the business is facing problems based on the models that are constructed. A business analyst must be able to use their knowledge of the business and technology to analyze a problem and provide recommendations on how to remedy the situation.

Finally, the business analyst must be involved in the information system strategy within an organization. The purpose of having such a strategy is to, "…identify the required applications and their priorities, and be able to deploy resources to achieve them successfully" (Ward & Peppard, 2002, p. 279). Implementing a successful strategy requires in-depth knowledge of the business to ensure that the applications in an organization's portfolio are property aligned with the goals and strategic direction that the business is going. The business analyst can be a valuable asset to an organization in this respect.
Vongsavanh and Campbell also defined the necessary skills for both systems analysts and business analysts that would be needed to perform the

aforementioned roles. A list of the skills for each discipline are presented in Table 2.2 below (Vongsavanh & Campbell, 2008, pp. 1060-1062).

Table 2.2 - Skills for system and business analysts

Discipline	Skills Required
Business Analyst	Communication Elicitation Problem Solving Leadership Presentation Selling General Analysis
System Analyst	Communication Technical General Analysis Design Problem Solving Information System Implementation

Table 2.2 shows a clear representation of the different skill sets required by each discipline. Based on Table 2.2, the unique skills for a business analyst are: elicitation, leadership, presentation, and selling. The unique skills for a system analyst are: technical, design, and information system implementation. This visual comparison of the skills shows a clear distinction between a system and business analyst. The business analyst is more heavily focused on business skills that would be necessary to communicate with senior management and be able to present a business case to support the execution of a project. The skills required by the system analyst represent a different focus. The skills that are unique to the system analyst suggest a skill set that is concerned with the more

technical aspects of a project. The researcher disagrees to a certain extent regarding these skills. In the opinion of the researcher, elicitation is a skill needed for both a business analyst and a system analyst.

Vongsavanh and Campbell (2008), note that there is less emphasis placed on requirements elicitations and business knowledge for systems analysts (p. 1062). Finally, the authors make a couple of very important assertions. First, the authors proclaim that, “the main difference between the two roles is one of emphasis – business analysts are concerned with the business and how to use IT to achieve business goals, whilst a systems analyst is more concerned with software development and implementation” (p. 1062). Second, the authors make the claim that, “there is no clear-cut distinction between the roles and skill sets of business and system analysts. There is a continuum with some roles and skills more likely to be undertaken, or needed, by one group rather than the other” (p. 1066).

Both of these conclusions are significant. It indicates that even though there is an overlap between the two disciplines, there are differences that need to be accounted for. Concerning academic curricula, their research suggests that a subset of the skills and knowledge necessary for a business analyst may already be present in a system analysis curriculum. These findings also support the focus of this paper, in that there are likely changes necessary to the Purdue CIT curriculum to specifically meet the needs of undergraduate students who desire to become business analysts. Even if the changes required are based on a difference of emphasis between the two job roles, there is a high probability that

key aspects of performing the business analyst role are being overlooked. The literature review and resulting conclusions drawn by Vongsavanh and Campbell (2008) were particularly attractive to this research as a result of the number and variety of sources from which the role and skill determinations were made. In total, 35 sources, from both academic and non-academic origins, were referenced in order to arrive at the conclusions presented in the paper (p. 1060, 1067-1068). Their work represents a large assessment examining a breadth of sources that directly provides supporting evidence toward the need to address the research question proposed in this study.

A number of key findings in the previous two sections should be reiterated. First, there is an overlap between the roles of the system analyst and business analyst. The system analyst does need knowledge of the business to some degree. Second, one of the significant claims from Vongsavanh and Campbell (2008) was that the difference between the two professions is one of emphasis (p.1062). This finding is critical to this study. It was not expected that there would be a complete separation of roles and skills between the two disciplines. Having stated this, the researcher disagrees with the authors to some extent. Vongsavanh and Campbell (2008) claim that “there is no clear-cut distinction between the roles and skill sets of business and system analysts…” (p. 1066). The researcher, on the contrary, would argue that the differing emphasis between the roles does represent a clear distinction that can be used to differentiate between a system analyst and business analyst. As the literature suggests, the emergence of the business analyst has been a product of evolution

that is the result of time, changing technologies, and today's business landscape. Given the evolution and changes that have occurred, it may be necessary to develop a new curriculum focused on addressing these considerations.

2.4 An Overview of the Business Analyst Discipline

The discipline of business analysis is complex and continually evolving. Anderson (2012) states that, "BAs have come a long way from their early days of being mostly order-takers…" (p. 2). Traditionally, business analysts were "charged mainly with defining and communicating requirements…" (Schreiner, 2007, p. 50). Anderson (2012) and Schreiner (2007) present an interesting take on the history of the business analyst position. According to their perspectives, business analysts were not typically involved in the decision making process within an organization. Traditionally, many business analysts were directed to solely gather and define requirements. According to David White, a principal consultant and cofounder of Group 5 consulting:

> Historically, analysts interviewed business users and then wrote requirements that were 'thrown over the fence' to developers. The developers, who were often also the coders, had to work out important details for themselves with very little understanding of the business issues and very little feedback on the impact of their technical design. (Schreiner, 2007, p. 50)

It can be inferred from White's assertion that there were negative implications to an organization when their business analysts were functioning in this manner. The primary issue is the long-standing elephant in the room for IT related projects, poor requirements. Poor requirements can be extremely costly

to a given project, and can have consequences across an organization. Another key takeaway is the level of understanding, of both the business function and IT function, which is required to effectively communicate requirements and other important information between the various stakeholders on a project. This presents additional concern for IT education. IT undergraduate education typically focuses mostly on the technology, and the majority of the time, in the opinion of the researcher, ignores the business considerations that would be present in industry. While it can be debated as to whether it is the responsibility of an IT curriculum to focus on business aspects or not, it is harder to debate the dependence and strategic alignment that is necessary between the business and IT functions in today's business environment if an organization is to be successful. Schreiner (2007), in response to White's comments regarding the situation where business analysts would handoff requirements to developers who had little knowledge about the business, stated, "The situation could and often did lead to project disasters, as radically differing assumptions about system details resulted in a costly illustration of the two distinct mindsets on either side of the metaphorical fence" (p. 50).

Kathleen Barret, the IIBA® President and CEO, points out some of the startling statistics related to project failures. She emphasized a number of key statistics, such as the fact that 71% of failed software projects are directly related to poor requirements, and that $250 billion globally is wasted every year due to having poor requirements (Barret, n.d., p. 2). Barret also points out that in the U.S. alone, "$46 billion is spent on fixing software requirements errors" (Barret,

n.d., p. 2). These numbers are very significant given that companies operating in a capitalistic environment are heavily focused on profitability. In order to address these issues many changes have taken place, including new development methodologies and software tools. The impact of these new methodologies on the role of the business analyst will be addressed next.

Business analysts are now becoming more involved on projects. Anderson (2012) argues that the modern role of the business analyst requires a deeper level of interaction on projects, which may result in a business analyst being placed directly on a development team. Within this role, the business analyst will then become part of the decision making process, and ultimately help determine the direction that a project takes (p. 2-8). The need for this increased level of involvement was the result of various factors. Barret (n.d.) identified multiple influencing factors on the emergence of the discipline of business analysis. Business process management, business rules, agile methods, enterprise architecture, and business intelligence were all identified as factors that have an impact on the role that business analysts play (p. 4). Additionally, Schwaber and Karel (2008) mention other considerations including enterprise initiatives spanning functional silos, service-oriented architecture, technology populism, and business performance demands (p. 5-6). Of the said impacting areas, agile software development is an area that has received a great deal of attention and continues to prove itself as a popular trend. Covering the specifics of the various flavors of agile software development methodologies available is outside of the scope of this research, however, the effect it has on business analysis is an

important piece to understand the evolution of the business analyst role. Alissa Anderson of Forrester Research examined how agile software development is changing the role of business analysts. She states that, “With the advent of Agile development, business analysts (BAs) have to prove their worth in a developer-centric environment where their role may be seen as nonessential” (Anderson, 2012, p. 2). While agile software development surely presents challenges to current and future business analysts, it can also provide opportunities as well. Anderson (2012) claims that agile software development can actually improve the business analyst role because it values team members and team cohesiveness, brings people together, and removes the “us and them” mentality (p. 5-6). Anderson also reiterates the idea of the shift in the traditional business analyst role stating, “The BA role is evolving to meet the needs of both an Agile and a hybrid-waterfall world” (Anderson, 2012, p. 7). The role of business analysts has obviously changed and will continue to change. This leads to the question of what these changes mean specifically to the knowledge and skills necessary for current and future business analysts.

Modern business analysts need a unique set of skills to be successful in a challenging industry. Gerush (2009) states that training for business analysts should help them “obtain cross-functional knowledge and experience by exposing them to new technologies and different business units and cross-training them in project management, development, and quality assurance” (p. 12). This is a key driver for the new role of business analyst. While traditionally, the business analyst had to understand both IT and the business to some extent,

there is now an increasing need, and expectation, that business analysts have a much deeper understanding of both sides. Wailgum (2009) adds, “The line between pure business functions and IT functions has eroded” (p. 1). This same concept is supported by Schreiner who discusses the influence of IT relative to meeting business objectives. Schreiner (2007) states, “with IT offering businesses opportunities to develop products, enhance and repurpose knowledge capital, manage workflows, and so on, the ability to remove that fence and bridge the worlds it previously divided can be key to developing successful solutions and organizations” (p. 50). Other key skills for business analysts in today’s business landscape focus on communication and adaptability. Just as developers and system architects need to be open to learning new tools and technologies, so must business analysts (Anderson, 2012, p. 7). Alissa Anderson of Forrester Research states that modern business analysts must be able to facilitate authority in order to successfully manage interaction amongst team members and have the skills necessary to communicate concisely to aid in requirements elicitation and to build trust (Anderson, 2012, p. 7). Anderson (2012) also contests that business analysts should remain open-minded and adaptable to be able to work on projects using different methodologies, live “customer first”, and finally, be able to negotiate fiercely and fairly to be able to balance customer wants and needs with business goals (p. 7).

This section of the literature review covered the traditional roles and responsibilities of the business analyst discipline. Additionally, the influencing factors on the discipline were discussed to highlight how the necessary skills

have changed to respond to the needs of industry. In the next section, the importance and job demand for business analysts will be presented.

2.5 Business Analyst Importance and Job Demand

The relevance of the research question would be reduced if there was a declining need for business analysts. However, research shows that not only is the profession important to businesses, but there is a high demand for individuals that can fill business analyst roles. In order to convince those in academia that an undergraduate concentration is needed, it must be shown that the profession is a lucrative one.

In a 2007 report published by *Computer Economics*, it was revealed that business analysts represent 4% of the average organization's IT staff. This percentage more than doubles if an organization is "…IT intensive, with a high level of new development activity…" ("Business Analyst Staffing," 2007, p. 13). Another interesting finding in this report was related to the effects of outsourcing. The report claims that, "staffing for business analysts is largely unaffected by the decision to outsource applications development" ("Business Analyst Staffing," 2007, p. 14). Simply put, "business analysts are needed to define business requirements and to represent end users whether software development is performed in-house or outsourced" ("Business Analyst Staffing," 2007, p. 14-15). This is quite significant when considering that many companies have begun outsourcing development-type roles, provided that a market exists where workers

can be paid less to perform the same tasks versus hiring an employee in the United States. Barret (n.d.) also points out this trend of outsourcing stating, “Organizations are focusing on their core competencies and outsourcing everything else” (p. 1). Any job that is resistant to outsourcing is likely deemed critical by a variety of parties within an organization. If the business analyst position is not being outsourced, it suggests that many organizations consider the role to be a key component driving the success of their projects. Oftentimes positions will be outsourced because having a physical presence in the office is not required, or because the organization simply does not have the expertise or resources. The literature discussed above supports the argument that business analysts are worth the investment and play an important role that cannot simply be outsourced to a third party.

The role of the business analyst is also seen as important by reputable magazines and business executives. *Money Magazine* rated the profession among the top 12 jobs to pursue in 2011 (Fitzgerald, 2012, para. 3). Allen Hackman, senior direction of information technology at Tyco International’s Fire and Security unit, states, “It’s one of the most critical roles in the info tech space” (Fitzgerald, 2012, para. 4). Hackman also makes the claim, “The make-or-break part of a corporate IT department is really the business analyst. It starts and ends with them” (as cited in Fitzgerald, 2012, para. 6). Statements by an IT executive, such as Allen Hackman, carry a lot of weight when determining the importance of the profession. Fitzgerald (2012), referencing a conversation with Mark McDonald of Gartner on the subject of business analysts, states that McDonald

believes “it’s no wonder both sides consider the business analyst to be the most popular job in IT right now” (para. 28). In the previous quote, the usage of the phrase ‘both sides’ refers to the business side and the technical side of the organization.

It can be seen that the business analyst role is important, but the question remains as to whether there is unmet demand for people that can fill the role. Kathleen Barret, in a letter as part of the IIBA® monthly newsletter in January 2011, says, “If there is no change, you don’t need business analysis. But when there is change – and there is always change – business analysts make sure it is the right change” (Barrett, 2011, p. 2). This is a simple but powerful statement that makes it clear the profession of business analysis will not be going away any time soon. One of the best ways to examine the interest in business analysis is to look at numbers related to certifications, membership, and chapters from the IIBA®. As of February 1, 2010, there were 827 CBAP® recipients, 11,976 members, and 89 chapters. The most recent statistics as of February 1, 2013 show 2,480 CBAP® recipients, 26,860 members, and 111 chapters. Simple calculations show that the difference in about three years was a 199.9% percent increase in CBAP® certifications and a 124.3% increase in membership (“Dashboard”, 2013; “BA Connection”, 2010, p. 3). These are very large increases for a relatively short time frame. Clearly there is a growing interest in the profession which is a good indicator of job demand and job security.

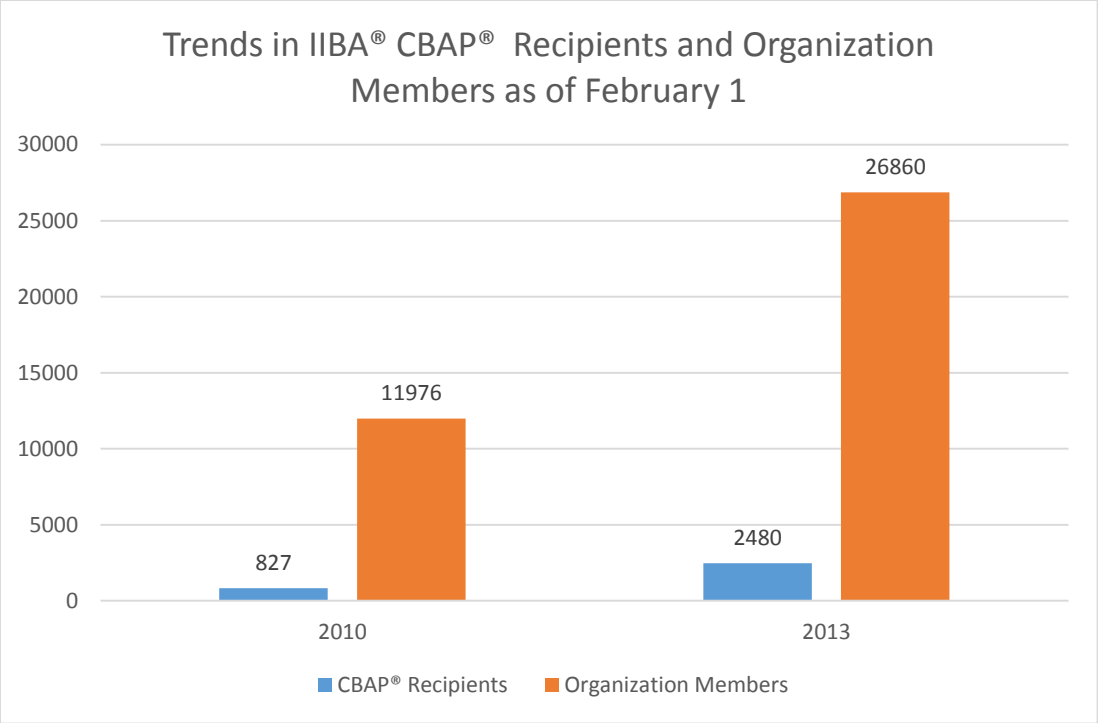

Figure 2.1 Trends in IIBA® CBAP® recipients and organization members ("Dashboard", 2013; "BA Connection", 2010, p. 3)

Preliminary research on job demand led the researcher to compare various job search websites for business analyst openings. Given the ease of access to websites of this type and their postings, it proved to be a quick and effective method of providing an overview of the state of the business analyst job market. Four websites were utilized to collect the data: simplyhired.com, dice.com, careerbuilder.com, and linkedin.com. For each website a search was executed searching for the exact phrase "Business Analyst". The results, as of April 4, 2013, are displayed in Table 2.3 below.

Table 2.3 Number of business analyst job postings by website

Website	Number of Job Postings
Simplyhired.com	206,891
Dice.com	4,079
Careerbuilder.com	4,459
Linkedin.com	1,765

It is assumed that the variance in number of results returned is due to the databases utilized by each site, as well as the decision of the recruiter posting the job opening as to what site they determined was the best for the position they were looking for. It is also important to point out that dice.com is only aimed at IT-related jobs, while the other sites search multiple industries. Within the results, only careerbuilder.com and linkedin.com allowed for narrowing of results by specific industry. For those sites, IT-related job postings were 2,289 and 869 respectfully. The site simplyhired.com did not provide the option to limit results by industry, thus explaining why the result set was so large. In total, there were 217,194 job postings matching the exact search phrase “Business Analyst”. Additional resources were also referenced to support these findings and will be discussed next.

The U.S. Bureau of Labor Statistics provides data on employment from a number of perspectives. For the purposes of this research, an attempt was made to identify the future trend in number of business analyst jobs. The U.S. Bureau of Labor Statistics offers access to occupational projection data using the timespan 2010-2020. Unfortunately, their website did not specifically list ‘Business Analyst’ as one of the occupations in their database. This was not

surprising considering the many different titles given to the profession due to the number of different roles that business analysts play, as well as the discussed evolution of the role from the system analyst. The closest occupational match found in the database was ‘Computer Systems Analyst’. This role was described by the U.S. Bureau of Labor Statistics as someone who, “[studies] an organization’s current computer systems and procedures and make[s] recommendations to management to help the organization operate more efficiently and effectively. They bring the business and information technology (IT) together by understanding the needs and limitations of both” (“Computer systems analysts,” 2012). While this occupation may not completely represent the role of the business analyst, it does provide a benchmark that can provide insight into the demand for business analyst type roles. According to the data, the projected percent increase in ‘Computer Systems Analysts’ is 22.1%. To give more perspective to this percentage, the projected percent increase for all other occupations combined is 14.3% (“Computer systems analysts,” 2012).

Linkedin.com provided the next source of data. Linkedin.com is a very popular resource for business professionals in recent years. It provides a platform for individuals to maintain a professional presence online and build a network of resources. One of the many useful features of the website is that it allows for the creation of groups to bring together people with similar interests. During the course of researching the BA field on the website, the group ‘Business Analyst Recruiters’ was discovered. Within a given group, the site provides statistics related to the number of members and growth in membership overtime.

For this particular group, at the time of this research, there were 10,385 members and a 27% week over week growth rate ("Statistics about business," 2013). These figures further help reinforce the proposition that business analysts are in high demand and are actively being targeted by recruiters.

Wantedanalystics.com was the final resource referenced. According to their data regarding business analyst jobs, “In July of 2012, there were more than 21,000 jobs being advertised online, up 5% from July 2011” (Lombardi, 2012, para. 1). Lombardi (2012), goes on to state that, “Interestingly, Business Analysts seem to be in demand across the organization…While demand has grown for this talent, the available supply of potential qualified candidates hasn’t increased at the same rate” (para. 2 & 4). In the previous quote, the phrase “across the organization”, refers to the demand for business analysts in different organizational business units. It is very apparent from the resources referenced above that there is a high demand for business analysts. The last point made by Lombardi, referring to the shortage of talent, is especially important to support investigation of the research question. It can be inferred from Lombardi’s claim that there are not enough graduates coming out of universities that possess the skills and competencies necessary to perform as a business analyst. If an effective and attractive business analyst concentration can be created for the CIT department, it will produce high quality graduates that can fill the open business analyst positions to better meet the demand.

2.6 Curriculum Considerations

Thus far the literature has suggested that there has been a shift in the business analyst profession, and additionally that the role business analysts play in today's organizations is important and in high demand. With regards to the primary purpose of the research question, this would suggest there should be targeted programs teaching undergraduate students the skills necessary for the profession. The remainder of this section will offer a high-level discussion of two model curricula that are specially geared toward IT. Additionally, some of the major issues facing higher education technology departments will be presented.

At the time of this research, there were two primary documents representing the relevant model curricula available to higher education technology programs. These documents were the *IS 2010 Curriculum Guidelines for Undergraduate Programs in Information Systems* and the *IT 2008 Curriculum Guidelines for Undergraduate Programs in Information Technology*. The organizations responsible for the development of the IS model curriculum were the Association for Computing Machinery (ACM) and the Association for Information Systems (AIS). The IT model curriculum was developed by the ACM and the IEEE Computer Society. Each of these documents will be examined with respect to their impact on current system analyst and design curriculum offerings. Discussion of current influences on system analysis curricula will add an additional basis for later identifying any potential shortcomings in the current CIT course offerings.

The *IS 2010 Curriculum Guidelines for Undergraduate Programs in Information Systems* is the first model curricula that will be addressed. The model curriculum, “provides guidance regarding the core content of the [Information Systems] curriculum that should be present everywhere and suggestions regarding possible electives and career tracks based on those” (Topi et al., 2010, p. vii). The authors identified a number of high-level outcomes that the curriculum should address. These high-level outcomes are, “improving organizational processes, exploiting opportunities created by technology innovations, understanding and addressing information requirements, designing and managing enterprise architecture, identifying and evaluating solution and sourcing alternatives, securing data and infrastructure, and understanding, managing, and controlling IT risks (Topi et al., 2010, p. vii). The final version of the model curriculum is based on seven core courses including the foundations of information systems, data and information management, enterprise architecture, IT infrastructure, IS project management, systems analysis and design, and IS strategy, management, and acquisition (Topi et al., 2010, p. 10).

As previously mentioned, the *IS 2010 Curriculum Guidelines for Undergraduate Programs in Information Systems* identifies system analysis and design as a core course offering. Within the model curricula, a specific description of the course, learning objectives, as well as recommended topics are presented. In total, 13 learning objectives were listed for the course, as well as 16 topics (Topi et al., 2010, p. 51-52). One of the interesting findings from this document was the level of focus on the business. Contrary to what was expected,

the documents explicitly states, “The course will teach students methods that allow them to specify requirements precisely and communicate effectively with both business stakeholders and developers, but it will not include material related to the design or implementation of the technical structure of the system” (Topi et al., 2010, p. 52). The previous statement seems to challenge much of the literature available on the subject of systems analysis. This finding will be discussed in full detail during the analysis that is the subject of this research.

The second model curriculum that will be discussed is the *IT 2008 Curriculum Guidelines for Undergraduate Programs in Information Technology*. In contrast to the *IS 2010 Curriculum Guidelines for Undergraduate Programs in Information Systems,* this model curriculum is much more focused on technical topics. The authors of the model curriculum define IT from an academic perspective as a field, “concerned with the issues related to advocating for users and meeting their needs within an organizational and societal context through the selection, creation, application, integration, and administration of computing technologies” (Lunt et al., 2008, p. 9). The purpose of the document is to serve as a “guide for institutions of higher education in the creation and/or revision of four-year programs in IT” (Lunt et al., 2008, p. 10). The authors decided to take a different approach to determining the core courses that should be reflected in an IT higher education curriculum. Lunt et al. (2008) developed what they deemed the ‘Information Technology Body of Knowledge’ (p. 27). The body of knowledge consisted of 13 main knowledge areas including information technology fundamentals, human computer interaction, information assurance and security,

information management, integrative programming and technologies, math and statistics for IT, networking, programming fundamentals, platform technologies, system administration and maintenance, system integration and architecture, social and professional issues, and finally web systems and technologies (Lunt et al., 2008, p. 27). Similar to the previously discussed model curriculum, each of the main knowledge areas were broken down into learning objectives and topics. Relative to systems analysis and design related courses, the knowledge area of system integration and architecture, as defined by the authors, most closely represents the needs of the system analyst. This specific knowledge area covers the topics of requirements, acquisition and sourcing, integration and deployment, project management, testing and quality assurance, organizational context, and architecture (Lunt et al., 2008, p. 113-117). The learning objectives and topics defined within this model curriculum will be discussed and analyzed in further detail during the analysis and investigation of the research question. While the model curricula discussed provided an effective means for higher education to implement relevant and meaningful courses, there are still multiple issues that technology programs face which will be the focus of the remainder of this section.

One of the greatest challenges of higher education technology programs is simply keeping up with the pace of technological change and industry trends. The *Communications of the Association for Information Systems* has performed research on issues that IT curriculums have faced. In the 2009 article, “IT Workforce Trends: Implications for Curriculum and Hiring”, they presented four primary conclusions: 1) graduates are not being trained in areas that the

marketplace is seeking, 2) there is a thin pipeline for specific technical skills, 3) there is an increasing pressure to source IT capability, and 4) there is a lag in university responsiveness to the needs of the marketplace (Bullen, Abraham, Gallagher, Simon, & Zwieg, 2009, p. 129). Their final conclusion is especially important to this research. If the CIT department is to continue to meet the needs of future students, it must respond more quickly to the changes taking place in industry. Additional data in the article showed that IT and IS curriculums, "could be strengthened by exposing students to cross functional courses and projects that emphasize supporting business processes" (Bullen et al., 2009, p. 136). In order to address the issue of responsiveness of academia, Bullen et al. (2009) suggest that, "Academia and industry together as partners need to rethink the curriculum for IT-related projects and the hiring requirements for IT professionals…" (p. 139). Undertaking this research will provide a starting point of debate between the CIT department and its Industry Advisory Board regarding how to best adapt current course offerings to expectations of both students and industry professionals. It is the hope of the researcher that this research can be beneficial to the CIT department by bringing their course offering up-to-date to meet the needs of one the critical positions in the industry today, the business analyst.

2.7 Summary

The topical discussions preceding this section provided a review of the literature as it pertains to the research question of this paper. The first topical

section, which discussed an ‘Overview of the System Analyst Discipline’, is an important starting point for providing the basis for this paper. Understanding the history of system analysis is an important first step to understanding the emergence of the business analyst.

The second section, ‘Overview of the Business Analyst Discipline’, provides additional insight into the role and how it was evolved in recent years. The business analyst role has changed, and is currently evolving alongside an industry that is moving at an incredible pace. Given this change, it is vital that academic programs take notice and respond accordingly.

The third section, ‘Business Analyst Importance and Job Demand’, was an effort to illustrate the importance of the business analyst role to today’s complex organizations. This section also provided data representing the current and projected demand for the role. If a new concentration is to be developed and included into the current offerings of the CIT department, the underlying profession must be attractive to prospective undergraduate students.

Finally, the available model curricula were discussed and curriculum considerations were presented. These considerations were meant to support the need for an update to the current curriculum. The CIT department must keep up with current industry trends and update courses as necessary to reflect the changes.

It is the expectation of the researcher that this literature review has established a case for the research question of this paper. It is believed that through this discussion of the business analyst role, job importance and demand,

and curriculum considerations that it is clear that there is an opportunity to attempt to create a new business analyst concentration for the CIT department.

CHAPTER 3. METHODOLOGY

This chapter will cover the research methodology and framework for this thesis. The credibility, bias, and data collection will also be discussed.

3.1 Framework

The review of relevant literature showed the importance and need for business analysts, presented background on both the system analyst and business analyst disciplines, as well as provided a brief overview of IT-related curriculum considerations. In the field of IT, business analysts play an important role in an organization's ability to make effective decisions and deliver successful projects. Due to the importance of the discipline, it is necessary that higher education programs offer courses and plans of study tailored to such a discipline. In the opinion of the researcher, a concentration specific to the discipline of business analyst should be developed for the CIT program at Purdue University. Given the complex nature of this job role, combined with the specific implications brought on by the IT field, it can be difficult at times to determine what skills and competencies someone must possess in order to be a good business analyst. Should a business analyst concentration be developed for the Computer and Information Technology (CIT) curriculum at Purdue University to provide

undergraduate students the knowledge and skills for a successful career in the emerging business analysis discipline? Subsequently, if a business analyst concentration should be developed, how might a proposed business analyst concentration be created? These are the research questions that this thesis attempts to address. It is not the intention of the researcher to develop new courses, syllabi, or course materials that are tailored to meet the needs of today's business analysts. The goal of this thesis is to take the information and suggestions from the literature review, along with the experiences of the researcher, to drive a meaningful analysis to produce recommendations that will be beneficial to future CIT undergraduates and the CIT program.

3.2 Researcher Bias

In order to support the researcher's credibility, the impact of bias on this study will be discussed. It is important to understand the motivations of the researcher in this study. First, the researcher is pursuing a master's degree from the CIT program. Second, he has experienced first-hand, the challenges faced by many college graduates who wished to enter a discipline without having a formal concentration in their undergraduate education. Finally, he is in a unique position, based on his experience and education, to perform an analysis of the sources used for this study against the courses offered in the CIT curriculum and relevant colleges. Bias, in this instance, will play a role in the classification and prioritization of the underlying competencies identified from the IIBA®, and the IS and IT model curricula. Additionally, bias is present in the gap analysis between

identified competencies and course objectives, as well as in the suggested plan of study. While bias is seen throughout this study, it leverages the researchers experience and educational background to address the research question and allow for a feasible analysis to be conducted.

3.3 Methodology

A gap analysis was conducted on the data sources selected for this research in order to logically pursue an answer to the research question presented. The data sources were divided into two groups. One group consisted of data from the IIBA® and the IT and IS model curricula. The data in this group represented the skills and competencies needed by today's business analysts. The second data set consisted of course information from the CIT department including, but not limited to, course descriptions and learning objectives. The researcher took the following steps to complete the gap analysis and provide recommendations based on the research question:

1) Analyze the underlying competencies for business analysts defined by the IIBA® and divide them into like categories
2) Derive a list of learning objectives, skills, and competencies from both the IT and IS model curricula that are relevant to business analysts and categorize each by IIBA® knowledge area/competency
3) Acquire and analyze the course learning objectives for all currently offered CIT undergraduate courses

   a. From the complete selection of CIT courses, triage those that are more likely to contribute to the learning objectives for business analysts

4) Perform a gap analysis between the categorized data in steps 1 & 2 relative to the CIT learning objectives of selected courses completed in step 3
   a. Consolidate the data from steps 1 & 2 into a ‘Master List’, representing all of the learning objectives, skills, and competencies necessary for a business analyst curriculum
   b. Attempt to map CIT learning objectives to the ‘Master List’ based on the researcher’s best judgment, formed from the information learned in the process of the literature review and firsthand knowledge of the current CIT curriculum
5) Determine changes necessary for the CIT program to formally develop a business analyst concentration, assuming gaps exist in step 4. These changes could result in one or more of the following:
   a. Modifications to existing course
   b. Suggestions of new courses
   c. Deletion of existing courses to either make room for new courses, or to make room for non-CIT courses that would need to be added to the curriculum
6) Develop a proposed plan of study representing a business analyst concentration

7) Develop descriptions of all new or modified CIT courses, including learning outcomes
8) Recommendations for changes to non-CIT aspects of the curriculum, presented in an existing/proposed format

The steps laid out above symbolize the research plan that the researcher followed for the duration of this study. It was assumed that this methodology would result in a clear picture of the skills and competencies necessary to become a business analyst, in addition to how well those skills and competencies are currently represented by CIT courses. The primary deliverables upon completion of this methodology include a mapping of business analyst skills and competencies to CIT courses, recommendations for what types of courses would be needed to fill any gaps found, and a proposed plan of study representing a business analyst concentration.

3.4 Credibility of the Research

Given the qualitative nature of this study it was necessary that the suggestions and assertions presented by the researcher be reviewed in order to increase the credibility of the research. The findings and suggestions in this thesis have been reviewed by five faculty members with extensive experience in the IT field and select members of the CIT Industrial Advisory Board.

3.5 Data Collection

The data analyzed for this study was obtained from a variety of sources. The primary data sources included the IIBA® Business Analysis Competency Model, IS Model Curriculum, IT Model Curriculum, and the most current collection of CIT courses and their learning objectives maintained by the CIT department. The IIBA® Business Analysis Competency Model was obtained from Professor Kevin Dittman, CIT department faculty and IIBA® member, who was granted explicit permission to share the document with the researcher via email (see Appendix A). The IS and IT model curricula were both retrieved from the ACM's website. The final primary data source, a list of CIT courses and their learning objectives, was attained from Dr. John Springer of the CIT department. On August 14th, 2013 multiple emails were sent to Dr. Springer inquiring the process necessary to gather the required information for the study. That same day, Dr. Springer responded with an email containing an attached Microsoft Excel Spreadsheet. The spreadsheet included a list of learning outcome descriptions organized by course number, course title, and category number. Upon initial review of this spreadsheet, it was noticed that the categories for the learning outcomes were not included in the file. A follow-up email was sent to Dr. Springer on August 15th, 2013 to request information on these categories. Dr. Springer responded on August 15th, 2013 with an email containing a numbered list of category descriptions that were correlated to the category numbers included in the original spreadsheet. Later in the analysis, on October 9th, 2013, an email was sent to Professor Whitten of the CIT department requesting

learning objectives for a course he teaches that was not included in the initial spreadsheet document from Dr. Springer. Professor Whitten responded to this request on October 11th, 2013 with an email including a list of learning objectives for his course. Once received, these learning objectives were added to the initial spreadsheet. All emails, sent and received, in efforts to obtain this data are included in Appendix A.

3.6 Sample Selection

A subset of the CIT courses present in the data collected was chosen for further analysis. The triage of these courses was necessary to eliminate courses that were likely to have little to no value in a business analyst curriculum. Such judgments were made based on the skills and knowledge needed for a business analyst as described by the relevant literature in Chapter 2. The researcher's final decisions for courses to be included in the study, were primarily those courses included as a part of the CIT information systems technology concentration plan of study (Appendix J). Courses part of the networking engineering technology concentration (Appendix K) were largely ignored due to their low probability of being relevant to the skills and competencies needed for a business analyst outlined in Chapter 2. During this process, the technical level of each course also had to be considered. Using the information discovered from the literature review, the advanced levels of technical courses were ignored.

3.7 Learning Objective Mapping

The mindset and methodology specifically related to the mapping of learning objectives will be discussed in this section for further clarification and support of the decisions made during the analysis. A basic decision making framework was developed to enable a consistent means of mapping learning objectives. Decisions that were made regarding whether or not to map a particular learning objective were made completely on the basis of the wording and interpretation of the learning objective. Therefore, all attempts were made to ignore the topics and material covered in courses when examining the relative fit of one or more of their learning objectives. In some cases it was determined that a combination of CIT learning objectives could be mapped together to address a learning objective in the master list. During analysis, interpretations also had to be made for each learning objective regarding whether it was application based or understanding based. This evaluation also prevented mapping in some cases where the learning objective in the master list was geared heavily toward the application of knowledge or specific skill, and potential CIT course learning objectives were more focused on general understanding.

The level to which a given course's learning objectives represent the totality of information and skills taught in the course is outside of the scope of this research. As a result, there are learning objectives that are likely covered by a course but were not specifically defined in the form of one or more learning objectives. Examination of the accuracy and completeness of CIT course learning objectives should be addressed in future studies.

3.8 Summary

A gap analysis of skills and competencies from select sources and CIT course offerings is the primary purpose of this study. The analysis will hopefully shed light on whether current CIT courses could provide the necessary knowledge and skills for undergraduates wishing to become business analysts. The researcher wishes that future CIT undergraduates, as well as the CIT program itself, will benefit from the findings presented in this paper through the results of the gap analysis along with the discussion and recommendations from the findings.

CHAPTER 4. FINDINGS

In this chapter, the findings as a result of following the methodology defined in Chapter 3 will be presented. The methodology prescribed allowed for an analysis to be conducted through examination of CIT courses relative to learning objectives representative of the skills needed to become a business analyst. Course descriptions available through the Purdue University Catalogue can be referenced in Appendix M. An overview of these findings will be discussed from different points of emphasis, including a high-level examination of overall learning objectives accounted for, learning objectives mapped by individual CIT course, and finally by IIBA® knowledge areas/competency groups.

4.1 Data Consolidation and Preparation

The data for this study needed to be consolidated in order for an effective analysis to be performed. A master list of learning objectives representing the skills and competencies for a business analyst was necessary. The learning objectives and competencies from the IIBA® Business Analysis Competency Model, along with chosen learning objectives from the IS and IT model curriculum were combined into a Microsoft Excel spreadsheet to create this list. It is important to note that not all of the learning objectives present in the IS and IT

model curricula were included in this master list. The learning objectives that were chosen from the IT model curriculum were selected based on their course's perceived relation to the field of business analysis in the opinion of the researcher. These decisions were made based on the knowledge gained through the literature review. The IS model curriculum contained course suggestions for multiple career paths, one of those career paths being a business analyst. The courses included in the business analyst career path, as defined within the model curriculum were included in the analysis. The figure outlining the career paths and their associated courses can be found in Appendix B.

The researcher then attempted to map the learning objectives from both the IT and IS model curriculums into the IIBA® knowledge areas/competency groups. The IIBA® knowledge areas consists of business analysis planning and monitoring, elicitation, requirements management and communication, enterprise analysis, requirements analysis, and solution assessment and validation. The competency groups defined are analytical thinking and problem solving, behavior characteristics, business knowledge, communication skills, interaction skills, and finally general and specialized software applications (International Institute of Business Analysis, 2011, p. 31-41). For the purposes of this study, the learning objectives for general and specialized software applications were combined together. Lists of these learning objectives and their mappings can be seen in Appendices C-H. The learning objectives that were mapped to these categories expanded upon those included in the IIBA® Business Analysis Competency Model. The consolidated list of learning objectives, hereafter

referred to as the master list, can be referenced in Appendix I. Figure 4.1 below depicts a breakdown of the master list learning objectives by contributing source.

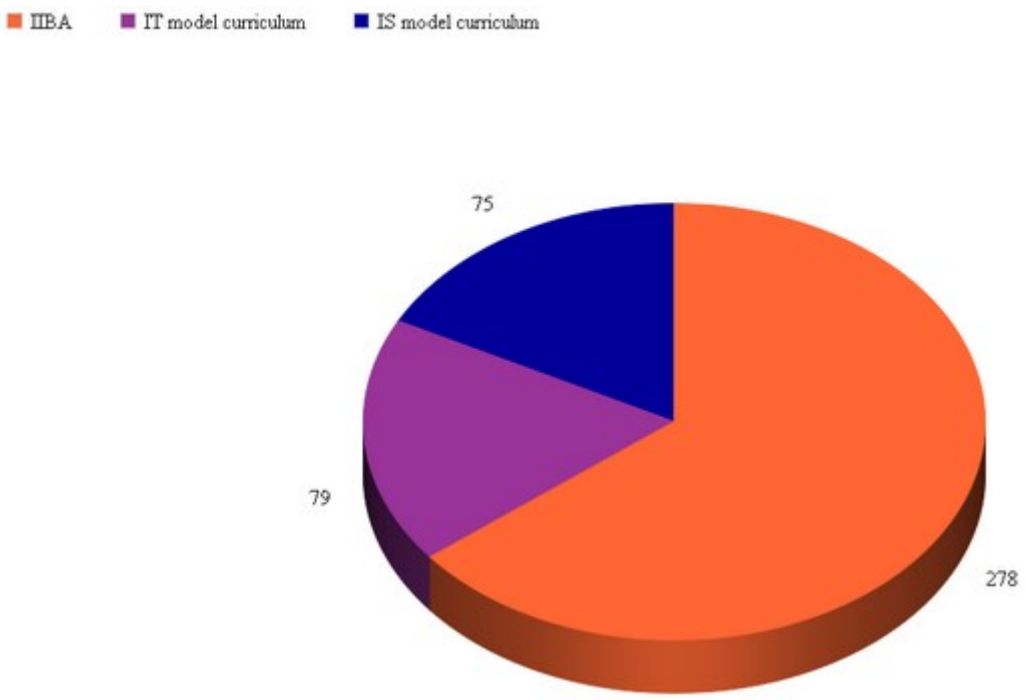

Figure 4.1 Breakdown of master list learning objectives by source

4.2 Overall Fit of CIT Curriculum to Master List learning objectives

Determining how well the current CIT undergraduate curriculum addresses the needs of a business analyst was a critical component in this study. Upon completion of the gap analysis between the CIT learning objectives and the master list learning objectives, the number of master list learning objectives accounted for was determined. Figure 4.2 displays the number of master list learning objectives that were addressed by one or more CIT learning objectives.

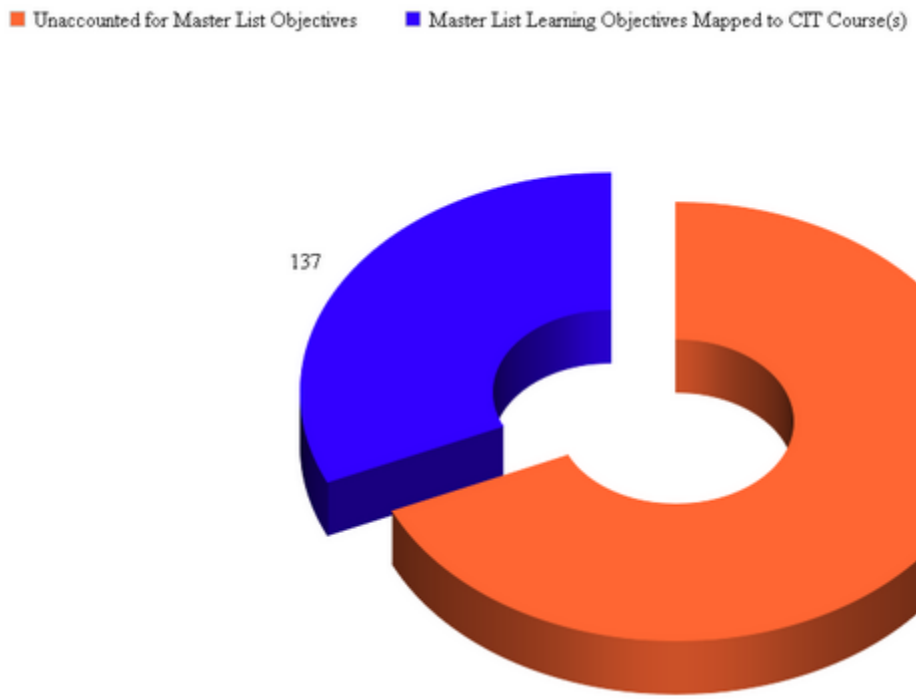

Figure 4.2 Number of master list learning objectives accounted for

A couple of important insights can be observed from this high-level data. One of the main observations is that the CIT courses alone, as part of the overall CIT curriculum, do not do a very good job of addressing the learning objectives necessary for a business analyst. Only 31.71% of the master list learning objectives are met by the learning objectives of one or more CIT courses. However, it should be noted that the analysis did not account for the entire plan of study which would address some of the identified gaps. Based on this information it is apparent that there are a number of areas for improvement which will be discussed in Chapter 5.

4.3 Results of Individual CIT Courses

The overall contribution and alignment of each CIT course to the learning objectives accounted for in the master list will be discussed in this section. After the initial gap analysis had been performed, the results were dissected by each CIT course. CIT course numbers and their corresponding name can be seen in Table 4.1 below.

Table 4.1 CIT course numbers and descriptions

Course Number	Course Name
CIT 155	Introduction to Object-Oriented Programming
CIT 175	Visual Programming
CIT 176	Information Technology Architectures
CIT 180	Introduction to Systems Development
CIT 242	System Administration
CIT 272	Database Fundamentals
CIT 280	Systems Analysis and Design Methods
CIT 321	Enterprise Social Media and Global Information Technology
CIT 380	Advanced Analysis and Design
CIT 38301	Packaged Application Software
CIT 399ISV	Software as a Business
CIT 405	Software Development Methodologies
CIT 480	Managing Information Technology Projects
CIT 487	Database Administration
CIT 488	Data Warehousing

The primary endpoint of performing this analysis was to determine how well each course was aligned with the learning objectives in the master list. Percentages were calculated for each CIT course representing the number of

learning objectives utilized versus the total number of learning objectives. The results can be seen in Table 4.2 below.

Table 4.2 Percentage of learning objectives mapped by course

CIT Course	Total LO for Course	Number of LO Mapped	Percentage Utilized
CIT 155	18	6	33.33%
CIT 175	17	6	35.29%
CIT 176	8	7	87.50%
CIT 180	13	9	69.23%
CIT 242	6	2	33.33%
CIT 272	34	19	55.88%
CIT 280	17	16	94.12%
CIT 321	4	3	75.00%
CIT 380	18	14	77.78%
CIT 399ISV	11	2	18.18%
CIT 405	10	9	90.00%
CIT 480	37	26	70.27%
CIT 487	20	5	25.00%
CIT 488	18	2	11.11%
CIT 38301	9	7	77.78%

When examining Table 4.2, it is important to notice the difference in number of learning objectives for each course. Courses with a smaller number of learning objectives were naturally inclined to have a larger percentage of their learning objectives be mapped in the gap analysis. Having stated this, the information presented in the table provides a useful means of identifying the courses which would be a strong fit for a proposed business analyst

concentration. The courses who had greater than 70% of their learning objectives utilized in the gap analysis were: CIT 176, CIT 280, CIT 321, CIT 380, CIT 405, CIT 480, and CIT 38301. A bar chart displaying the same information, arranged by Percentage Utilized from highest to lowest, was created to provide a more visual illustration of the data. Figure 4.3 below displays the ordered data.

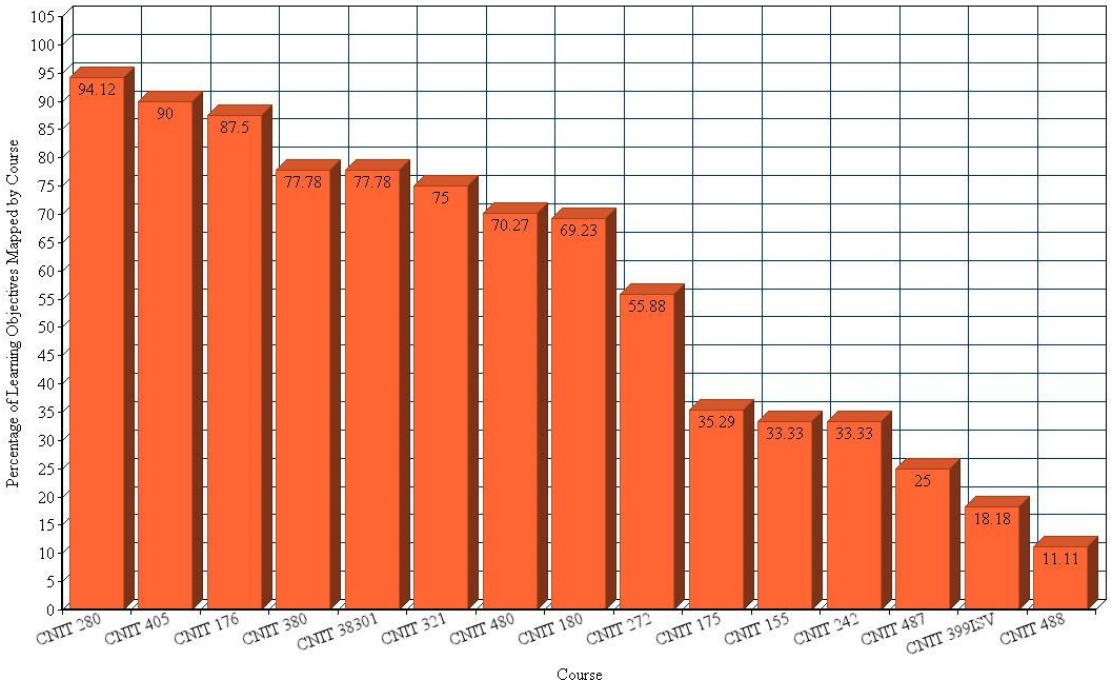

Figure 4.3 CNIT courses arranged by percentage of learning objectives utilized

The information presented in Figure 4.3 highlights those courses whose learning objectives best match up with those included in the master list. The courses with the highest percentages should become the focal point for creation of a business analyst concentration. The courses on the right-hand side of the

bar chart in Figure 4.3, may still provide value to a proposed concentration, however the primary objectives of the course are mainly aimed at addressing factors that were not specified in the master list.

4.3 Results of Gap Analysis by IIBA® Knowledge Area/Competency

Breakdown of the gap analysis results also needed to consider how well each knowledge area/competency defined by the IIBA® was represented. Exploring the data from this perspective provides insight into which of these areas would need the most focus to create an effective business analyst concentration. Table 4.3 shows the results of this analysis.

Table 4.3 Percentage of learning objectives mapped by IIBA knowledge area/competency

IIBA® Knowledge Area/Competency	Master List LOs	LOs with CIT Mapping	% Met
Business Analysis Planning and Monitoring	73	32	43.84%
Elicitation	17	7	41.18%
Requirements Management and Communication	55	14	25.45%
Enterprise Analysis	84	27	32.14%
Requirements Analysis	47	16	34.04%
Solution Assessment and Validation	51	15	29.41%
Analytical Thinking and Problem Solving	29	9	31.03%
Behavior Characteristics	20	6	30.00%
Business Knowledge	23	3	13.04%
Communication Skills	10	2	20.00%
Interaction Skills	18	6	33.33%
Software Applications	5	0	0.00%

It can be seen from this table that Business Analysis Planning and Monitoring (43.84%), Elicitation (41.18%), and Requirements Analysis (34.04%) are the knowledge areas that were best represented in the gap analysis. In the opinion of the researcher, the IIBA® knowledge areas were fairly well accounted for by CIT courses. The existing curriculum focused around systems analysis lent itself well to the learning objectives in the three aforementioned knowledge areas with the highest percentage of learning objectives met. One of the limitations of the gap analysis performed was mapping learning objectives based on their descriptions. As such, often times learning objectives could not be mapped based on their particular wording or points of emphasis. This limitation will be further discussed in Chapter 5.

A visual representation of the data in Table 4.3 is presented in Figure 4.4 below. Figure 4.4 combines all of the information present in Table 5 into a format that facilitates the interpretation of the data. One of the interesting observations is the trend line of the percentage of learning objectives met. With the exception of the spike for the interaction skills competency, a clear downward trend is visible. While the largest percentage areas have already been highlighted, it is also important to note the smallest. Business knowledge (13.04%) and software applications (0%) had the smallest percentages of learning objectives accounted for at the conclusion of the gap analysis. While the percentage relative to software applications may seem out of place considering the nature of the curriculum examined, it should be noted that the learning objectives in that category were directed to the use and knowledge of applications for performing

requirements related tasks. Possessing and applying business knowledge for the business analyst role was one of the main points of emphasis throughout the literature review. Based on Table 4.3 and Figure 4.4, the business knowledge competency appears to warrant increased importance within the CIT curriculum.

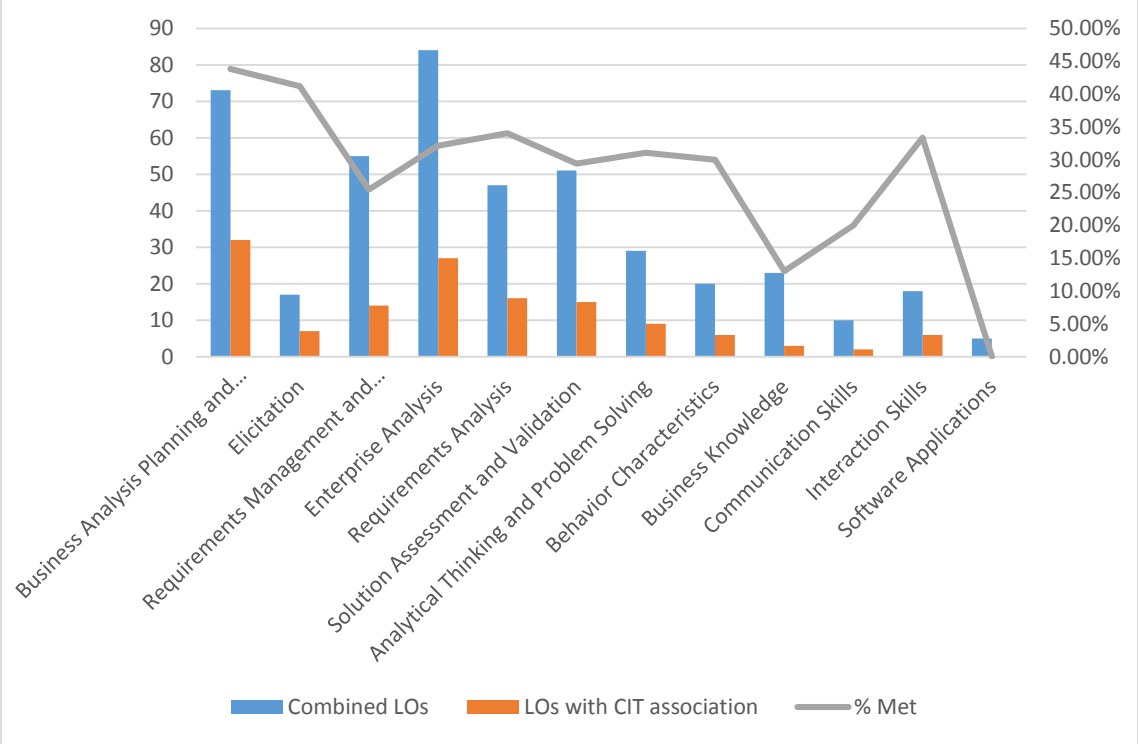

Figure 4.4 - Percentage of learning objectives met with trend line

4.4 Dual Examination of CIT Courses and IIBA® Knowledge Areas/Competencies

The creation of a figure to display a decomposition of accounted for learning objectives was created to form a more complete picture of the results. This decomposition was completed by deriving a total number of mapped learning objectives for each CIT course organized by IIBA® knowledge area and

competency. The data in this section examines CIT learning objectives mapped to one or more learning objectives in the master list. Note that one or more CIT learning objectives can be mapped to a single master list learning objective. The proceeding analysis examines the total number of CIT learning objectives mapped within each IIBA® knowledge area or competency group. The result is a higher total count of learning objectives versus the numbers in the previous three sections. Figure 4.5 illustrates the results of this effort.

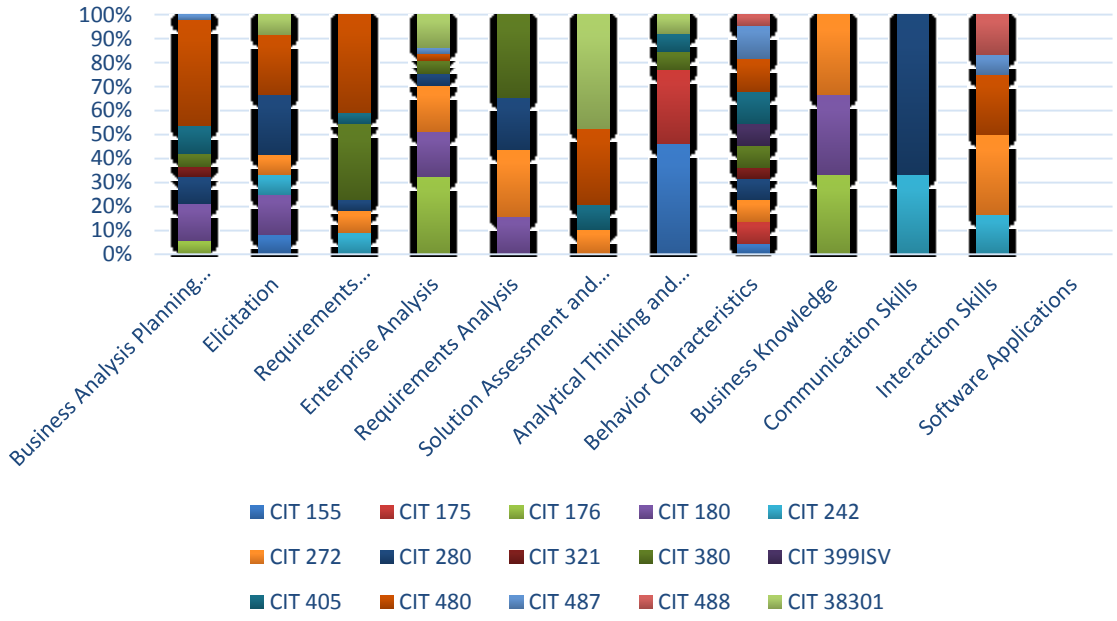

Figure 4.5 - Decomposition of learning objectives within IIBA knowledge area/competency

One of the critical observations represented by Figure 4.5 is that none of the IIBA® knowledge areas or competencies were addressed by a single course alone. The data suggests that multiple courses are needed to fill the wide range of learning objectives within each category. For each of the knowledge areas and

competencies, with the exception of the software applications competency due to no mappings, figures illustrating the individual decompositions will be presented and briefly discussed.

4.4.1 Business Analysis Planning and Monitoring Decomposition

This subsection, and those that follow, present figures that examine each knowledge area or competency group individually. For each CIT course, learning objectives mapped to one or more of the learning objectives from the Business Analysis Planning and Monitoring knowledge area were tallied. Figure 4.6 shows the contributing courses that resulted in the 52 CIT learning objectives mapped within the Business Analysis and Planning and Monitoring knowledge area.

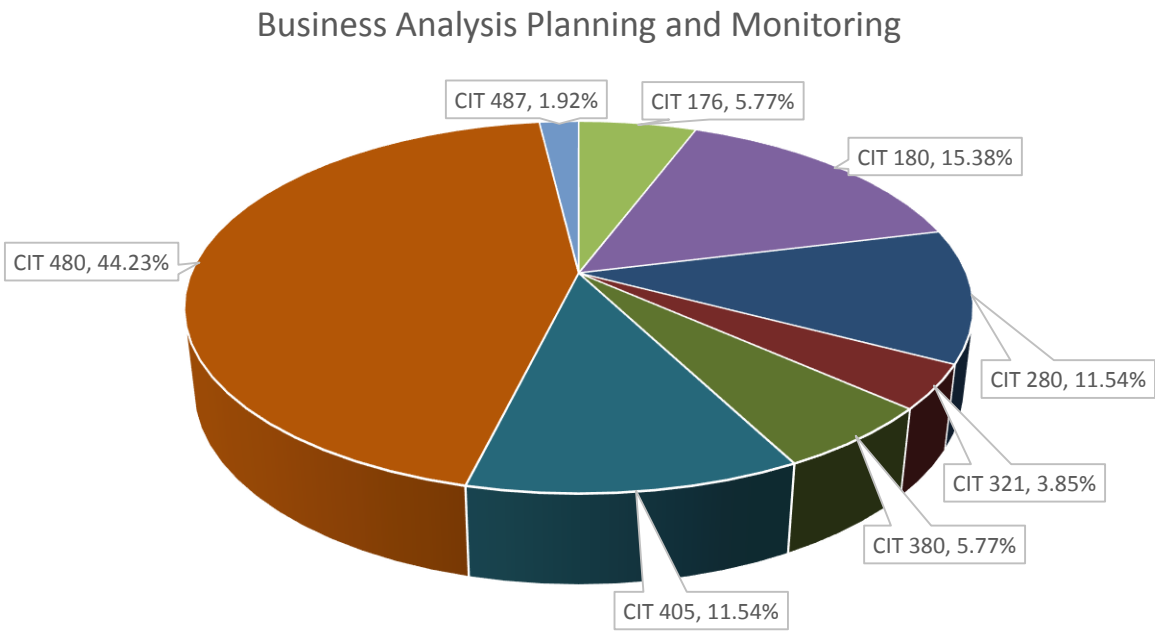

Figure 4.6 Percentage of Business Analysis Planning and Monitoring learning objectives accounted for by course

It can be seen from the figure above that CIT 480 (44.23%) and CIT 180 (15.38%) accounted for a combined 59.61% of the CIT learning objectives that were mapped for in this knowledge area.

4.4.2 Elicitation Decomposition

The Elicitation knowledge area was analyzed by course focusing on the percentage contributed by each. There were a total of 12 CIT learning objectives mapped within this particular knowledge area. Figure 4.7 shows the breakdown of contributing CIT courses and their impact on the total learning objectives mapped for this area.

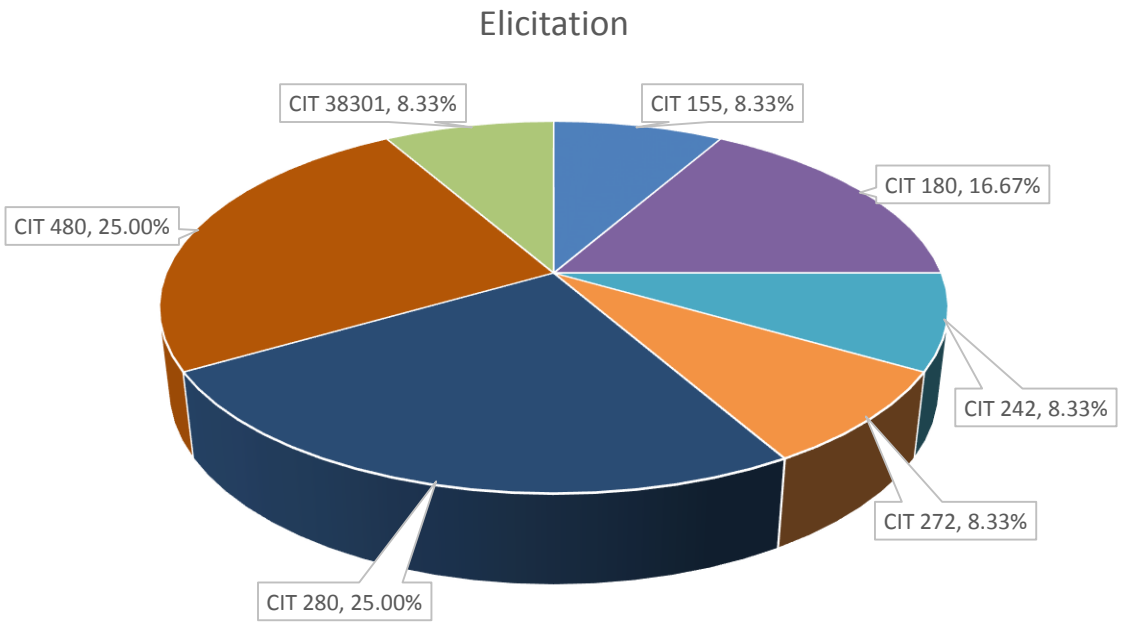

Figure 4.7 - Percentage of Elicitation Learning objectives accounted for by course

The top two contributing courses for the Elicitation knowledge area were CIT 280 (25.00%) and CIT 480 (25.00%). The remaining 50% of the learning

objectives accounted for in the Elicitation knowledge area were mapped between the additional five courses specified in Figure 4.7.

4.4.3 Requirements Management and Communication

The Requirements Management and Communication knowledge area had a total of 22 CIT learning objectives mapped. Each CIT course was analyzed to determine its percentage of contribution for the 22 CIT learning objectives mapped. Figure 4.8 displays the results of the data.

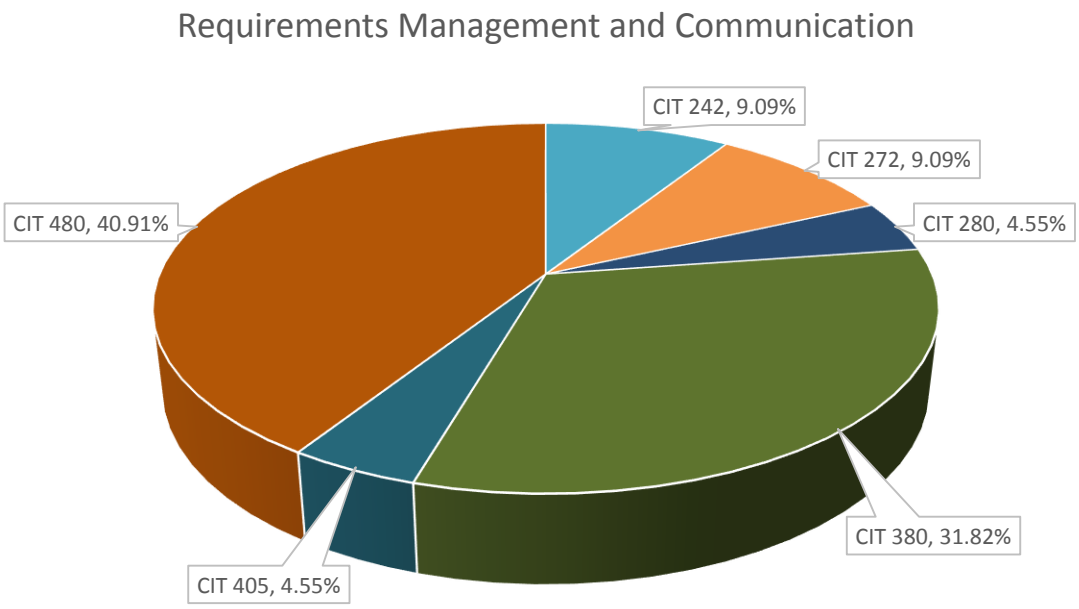

Figure 4.8 - Percentage of Requirements Management and Communication learning objectives accounted for by course

For the Requirements Management and Communication knowledge area, CIT 480 (40.91%) and CIT 380 (31.82%) were the top two contributing courses combining for 72.73% of the mapped CIT learning objectives. The remaining 27.27% were spread between the four additional courses seen in Figure 4.8.

4.4.4 Enterprise Analysis Decomposition

In total, 37 CIT learning objectives were mapped for the Enterprise Analysis knowledge area. For each of the 37 learning objectives, their originating course was determined to provide a clearer picture of the contributing sources. Figure 4.9 shows a breakdown of the 37 learning objectives accounted for by CIT course.

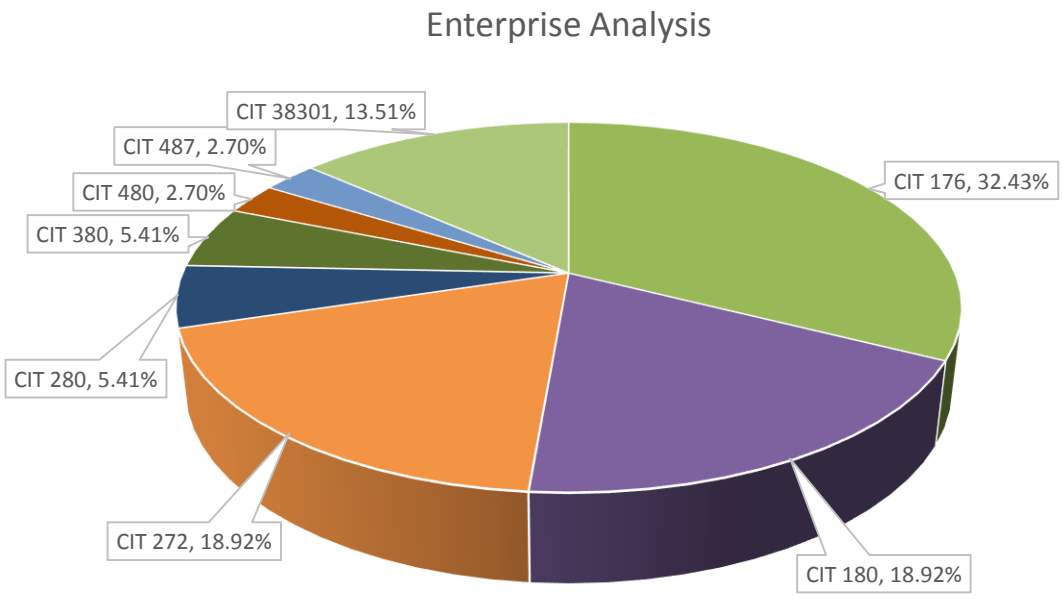

Figure 4.9 Percentage of Enterprise Analysis learning objectives accounted for by course

There were eight total courses that contributed to the 37 learning objectives that were mapped for the Enterprise Analysis knowledge area. Of these eight courses CIT 176 (32.43%) represented the highest percentage of accounted objectives. CIT 272 (18.92%) and CIT 180 (18.92%) came in second

making up an additional 37.84% of the total. The remaining 29.73% of learning objected were mapped to the remaining 5 courses present in Figure 4.9.

4.4.5 Requirements Analysis Decomposition

Within the Requirements Analysis knowledge area there was a total of 32 mapped CIT learning objectives. Each of these objectives were analyzed based on the course(s) that we mapped to one or more of the learning objectives in the category. Figure 4.10 shows the percentage of each contributing course relative to the total number of learning objectives for the Requirements Analysis knowledge area.

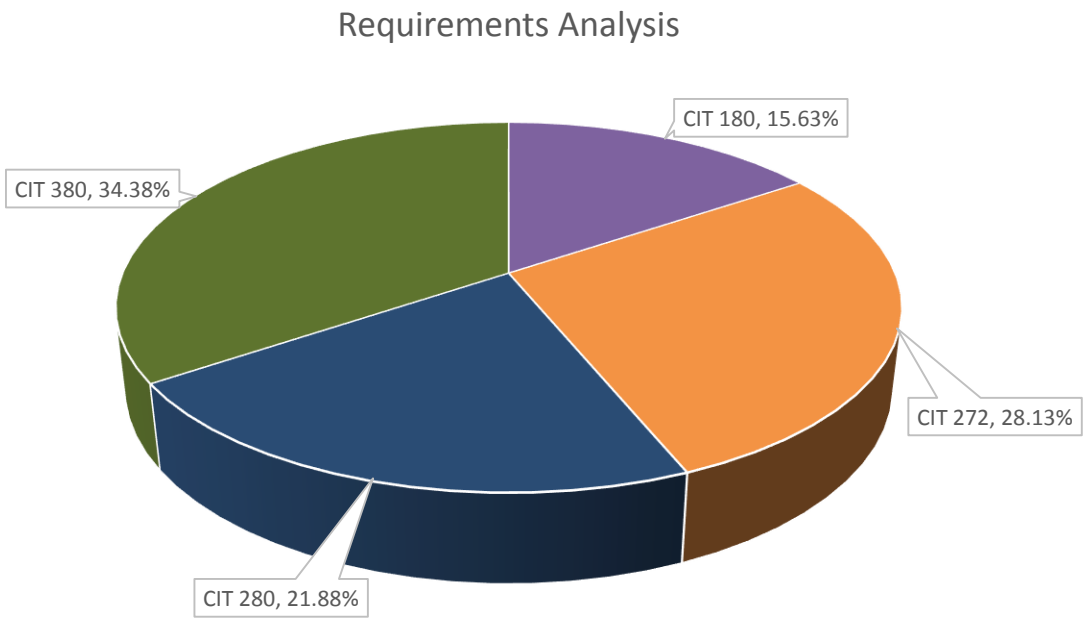

Figure 4.10 Percentage of Requirements Analysis Learning objectives accounted for by course

It can be seen from Figure 11 that there were four contributing CIT courses within this knowledge area. The top two contributors were CIT 380

(34.38%) and CIT 272 (28.13%), combining for a total of 62.51% of the mapped learning objectives. The remaining 37.49% were mapped from CIT 280 and CIT 180.

4.4.6 Solution Assessment and Validation Decomposition

There were 19 total CIT learning objectives mapped within in the Solution Assessment and Validation knowledge area. Each learning objective was traced back to its originating course. A breakdown of contribution to the 19 learning objectives mapped for was conducted. The results are displayed in Figure 4.11.

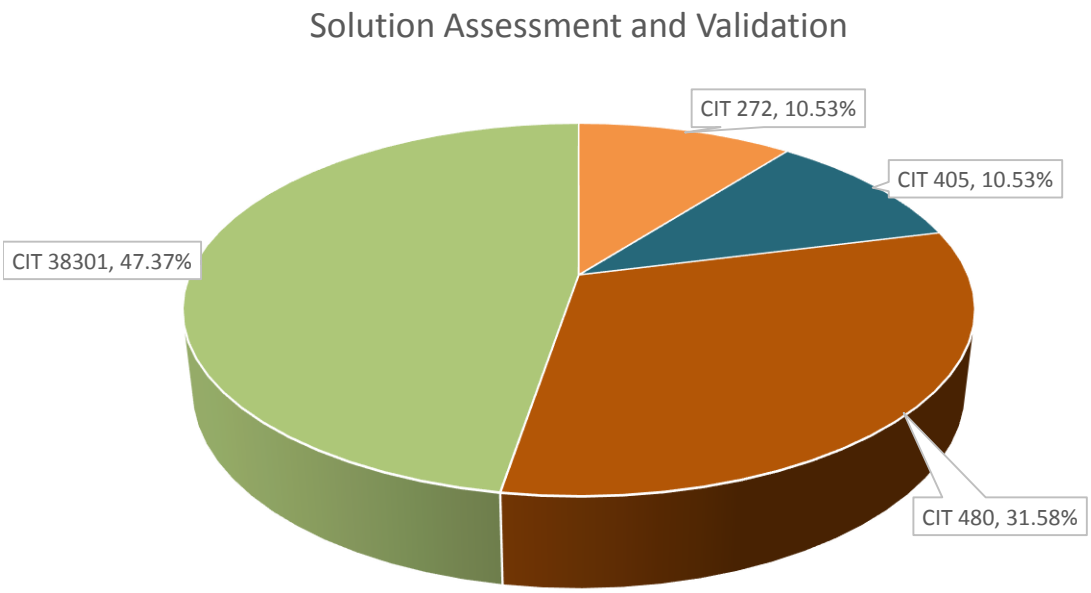

Figure 4.11 - Percentage of Solution Assessment and Validation learning objectives accounted for by course

Four courses contributed to mapping the 19 learning objectives for this knowledge area. CIT 38301 (47.37%) and CIT 480 (31.58%) made up for a

combined 78.95% of the total. The remaining 21.05% comprised of learning objectives mapped from CIT 272 and CIT 405.

4.4.7 Analytical Thinking and Problem Solving Decomposition

Analytical thinking is the first of the competency area groupings to be analyzed. Within this competency area, there was a total of 13 CIT learning objectives mapped. This total was broken down into contributing courses. Figure 4.12 displays the contributing courses for the 13 learning objectives.

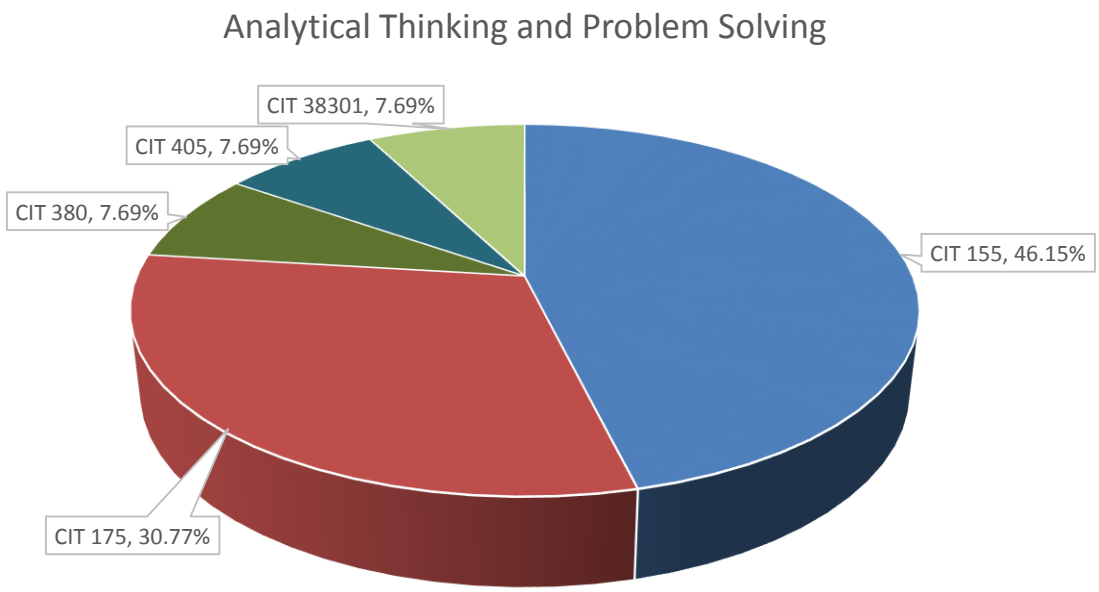

Figure 4.12 - Percentage of Analytical Thinking and Problem Solving learning objectives accounted for by course

Figure 4.12 shows five courses that contributed to the competency group. The two courses accounting for the largest percentages were CIT 155 (46.15%) and CIT 175 (30.77%) for a total of 76.92% of the total. The remaining 23.08% were mapped from the remaining three courses included in Figure 13 above.

4.4.8 Behavioral Characteristics Decomposition

Within the Behavioral Characteristics competency area there was a total of 22 CIT learning objectives mapped. For each learning objective mapped within this area, its CIT course was determined ultimately resulting in Figure4.13 see below.

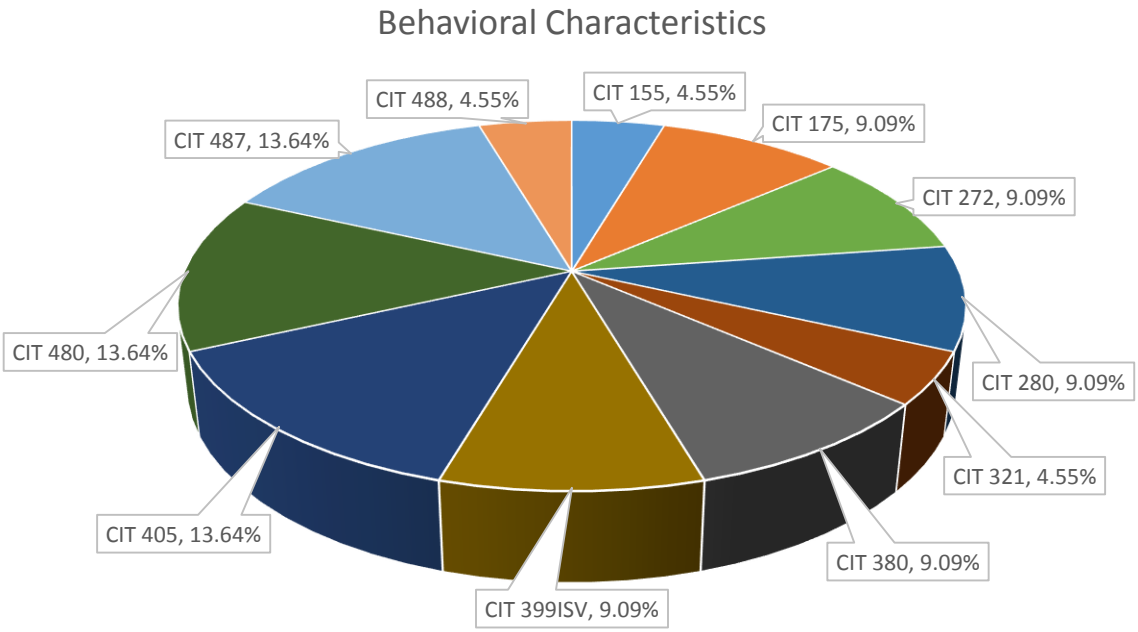

Figure 4.13 - Percentage of Behavioral Characteristics learning objectives accounted for by course

From Figure 4.13, it can be seen that there were 11 CIT courses that contributed to the total 22 CIT learning objectives that were mapped in this competency group. Among all of the knowledge and competency areas, Behavioral Characteristics had the largest number of contributing courses. Three courses: CIT 487, CIT 480, and CIT 405, contributed 13.64%, the largest percentage for an individual course within this category.

4.4.9 Business Knowledge Decomposition

A total of three CIT learning objectives were mapped within the Business Knowledge competency group. Figure 4.14 depicts the courses that contributed to the mapping of those objectives.

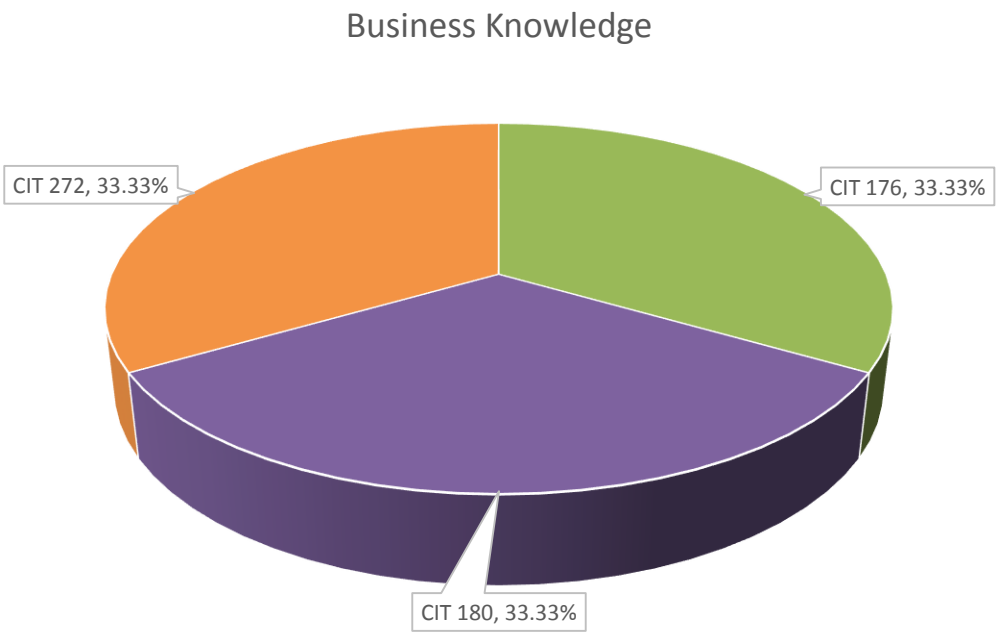

Figure 4.14 - Percentage of Business Knowledge learning objectives accounted for by course

Only three courses CIT 272, CIT 176, and CIT 180 contributed to this category. Each course was mapped to one objective, and thus accounted for 33.33% of the total.

4.4.10 Communication Skills Decomposition

Within the Communication Skills competency group there were three CIT learning objectives mapped. Figure 4.15 depicts the contributing courses that were mapped to these learning objectives.

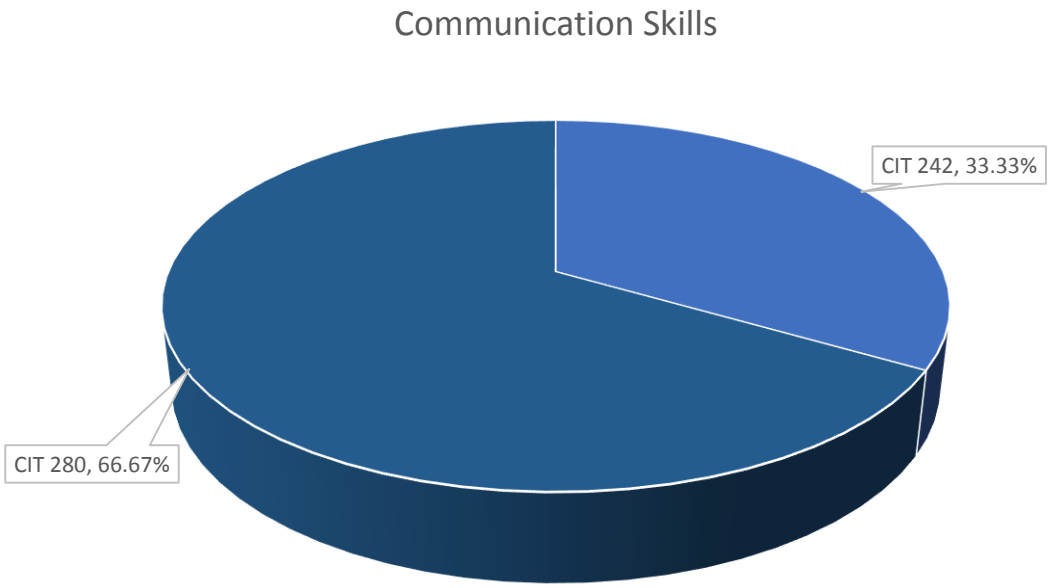

Figure 4.15 - Percentage of Communication Skills learning objectives accounted for by course

From Figure 4.15, it can be seen that there were two contributing courses to the learning objectives mapped within this category. CIT 242 (33.33%) and CIT 280 (66.67%) collectively represented the three learning objectives accounted for in the Communication Skills competency group.

4.4.11 Interaction Skills

There were 12 CIT learning objectives mapped within the Interaction Skills competency group. This was the last competency group analyzed as part of the gap analysis for this study. The CIT courses responsible for these objectives were identified and represented in Figure 4.16 as their percentage of the 12 objectives accounted for.

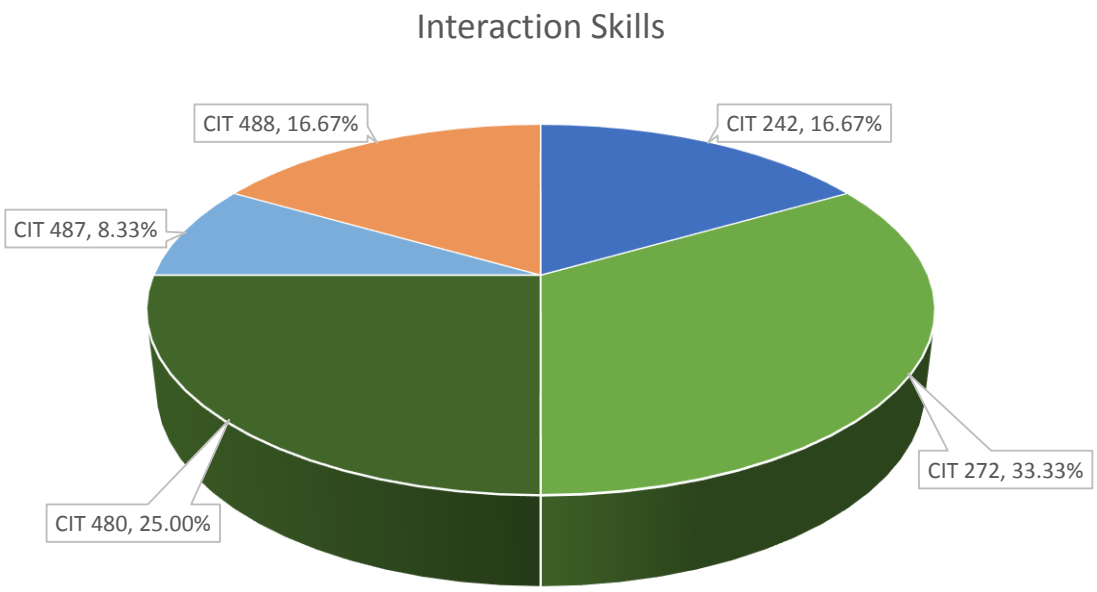

Figure 4.16 - Percentage of Interaction Skills learning objectives accounted for by course

Five CIT courses contributed to the mapping of the 12 learning objectives in this category. The course with the largest percentage contribution was CIT 272 (33.33%). CIT 480 (25.00%) also represented a large amount of the total mapped learning objectives. CIT 242 and CIT 488 each contributed 16.67% of the total. CIT 487 made up the remaining 8.33% of the CIT course learning objectives accounted for in this competency group. The Interaction Skills competency group is another one of the critical areas for a business analyst. Any proposed concentration should focus on courses who promote team work and collaboration using the latest tools. Working efficiently with team members from different ethnical backgrounds is also a key part of this group. Following this section is a brief summary of the data presented in this chapter.

4.5 Summary

The findings and results of this study were presented in this chapter. Results were presented and organized in increasing levels of detail. The first section aimed to provide an overview regarding how the data was prepared for analysis, as well as visually depict the contributing sources to the master list of learning objectives. In the second section, a high-level perspective of the results was given. The results in this section were meant to serve as an executive summary of the study. Next, results were analyzed by CIT course. For each course the total number of learning objectives were compared to the number of learning objectives mapped to the master list from that course. The table and figure within this section help to illustrate the level of alignment with business analysis that each course displayed at the conclusion of this study.

Section 4.3 displayed the results from the perspective of the IIBA® knowledge areas and competency groups. The purpose of this section was the highlight the percentage of learning objectives mapped by each category. Finally, in Section 4.4, the composition of each IIBA® knowledge area and competency group was analyzed by CIT course. The figures contained within this section and its subsections give insight into the details of the learning objectives that were mapped and their origins.

The findings presented in this chapter have shown that there are a number of conclusions and recommendations that can be derived. In Chapter 5, the conclusions and recommends formulated by the researcher based on the data in Chapter 4, will be discussed.

CHAPTER 5. CONCLUSIONS, RECOMMENDATIONS, AND SUMMARY

The findings of this study offered a great deal of insight into various aspects of the CIT curriculum and its ability to meet the skills and competencies for those undergraduate students who wish to become business analysts. This chapter will present the conclusions and recommendations of the researcher based on the findings discussed in Chapter 4. A brief summary will also be provided to recap some of the highlights of the study.

5.1 Conclusions

A large amount of information has been discussed prior to this chapter. This study aimed to address whether there was a need to develop a business analyst concentration for the CIT department at Purdue University, and if so, how might such a concentration be developed. The literature review in Chapter 2 provided ample support of showing that there was a need. Following the conclusion of the gap analysis performed, the findings suggested that there would need to be action taken by the CIT department to create such a concentration based on the recognized gaps in learning objectives between CIT courses and those included in the master list. Notable gaps were witnessed between the overall master list of learning objectives representing the skills and

competencies necessary for a business analyst, and the number of learning objectives mapped to CIT courses. Only 137 out of 432 master list learning objectives were mapped, representing 31.72% of the whole. While this percentage is slightly less than a third of the total, it should not be seen as a negative outcome. The CIT curriculum currently contains a variety of selective courses that undergraduate students must take to fulfill the requirements of the degree. These selective courses often are part of other departments within the university. The wide range of skills needed by business analysts cannot be directly addressed by the courses in a single department. A combined approach, including a selection of courses from multiple departments, is needed to completely address the requirements for the business analyst role.

The breakdown of CIT course's learning objective by percentage mapped to the master list was also significant to the study. An interesting perspective was shown via the relative alignment for each course to the needs of a business analyst by evaluating the number of learning objectives mapped compared to the total number of learning objectives for a given course. Referencing Table 4.1, courses with a high level of alignment (greater than 50%) with business analysis requirements should become part of a business analyst concentration. Those courses with lower percentages should be closely examined by department administrators to determine their importance to the overall degree. For courses with lower percentages of learning objectives mapped to master list learning objectives, those learning objectives that were mapped could potentially be added to another course having a higher percentage if applicable.

Other notable conclusions can be drawn from the results of the study from the perspective of each IIBA® knowledge area and competency group. It was seen in Chapter 4 that only two knowledge areas, Business Analysis Planning and Monitoring and Elicitation, had 40% or more of their learning objectives mapped to CIT courses. The data also shows that the areas needing the most work are the Business Knowledge and Software Applications competency groups. This data can help further focus efforts to create a business analyst concentration by enabling the CIT department to address those knowledge areas and competency groups that need the most attention, the trend line in Figure 4.4 helps to illustrate these areas. The same data also shows which knowledge areas and competency groups had the most learning objectives in the master list. Having this information can also help direct efforts to fill the gaps that can be addressed quickly without a large amount of intervention.

Another interesting observation was the variation in number of learning objectives and learning objective coverage for each course. The number of learning objectives for each course included in the gap analysis varied widely with a range of 33. This variation impacted the overall influence and impact that a course had with respect to its ability to map learning objectives to the master list. Based on the first-hand experience of the researcher, it was realized that there were inherent gaps between the topics and material covered in multiple CIT courses compared to the stated learning objectives. These gaps represent an issue that should be addressed by the CIT department. Not only did the gaps make the gap analysis for this study difficult, they are also problematic for

students who may not be tested on certain topics taught in the course because there is no corresponding learning objective defined. This finding led to recommendation *e* in section 5.3.

Finally, each IIBA® knowledge area and competency group was decomposed by contributing courses. This was an effective means for observing the various aspects of business analysis that each course addressed. It was reinforced from the figures in Chapter 4 section 4.4, that multiple courses are needed to address the learning objectives in each knowledge area or competency group.

5.2 Limitations of the Study

It is important to reexamine the limitations of the study after having concluding the analysis. Executing the gap analysis was dependent on the discretion of the researcher regarding the mapping of CIT learning objectives between CIT courses and those in the master list. This effort was, as a result, subjective in nature. Others may view the mappings of the learning objectives and attest to the decisions made or not made by the researcher. Another limitation witnessed during this process was the wording of the learning objectives. Based on the specificity of the wording, it was often difficult to accurately assess whether or not a particular learning objective should or should not be mapped. Lastly, the results of this study cannot be generalized beyond the CIT department at Purdue University. Based on the courses selected for analysis, and the learning objectives for those courses, the gaps will vary.

5.3 Recommendations

The design of this study was to address whether a business analyst concentration should be developed for the CIT department. Based on the literature review, and subsequent findings, the researcher believes that development of a business analyst concentration should be pursued. It order to successfully create the concentration, a number of recommendations will be offered based on the knowledge gained through completion of this study.

It is recommended that in the creation of a formal business analyst concentration, an attempt is made to account for as many of the unmapped learning objectives in the master list as possible. The CIT department, should it pursue the creation of a business analyst concentration, must ultimately decide which learning objectives they deem most important. It is possible that not all of the learning objectives in the master list need to be accounted for in order to have a successful business analyst concentration.

Based on the percentage of learning objective mapped for each course, it is recommended that all courses who had more than 50% of their learning objectives mapped to the master list be included in the business analyst concentration. These courses include: CIT 176, CIT180, CIT 272, CIT 280, CIT 321, CIT 380, CIT 38301, CIT 405, and CIT 480. The courses having less than 50% should be evaluated to see whether the learning objectives that were mapped could be added to other courses.

The researcher has proposed a plan of study to represent what a business analyst concentration may look like. The proposed plan of study can be

referenced in Appendix M. The foundation for the plan of study was centered on the aforementioned CIT courses who had greater than 50% of their learning objectives mapped in the gap analysis. The remainder of the plan of study was completed through identification of critical areas as a result of the gap analysis, as well as the suggested plan of study provided by the CIT department that was effective Fall 2013 (Appendix L). The gap analysis showed a variety of areas that needed to be addressed in the proposed plan of study. In the opinion of the researcher these areas were organizational change management, business processes, communication of technical information, requirements management, conflict negotiation, and general business knowledge. The Purdue University Course Catalogue and College of Technology website were used to identify courses that could satisfy the needs of these areas based on course descriptions. Multiple courses were identified that could potentially fill the identified gaps. These courses included CIT 550, CIT 551, Business Process Change Management, Requirements Management Processes, MGMT 175, COM 315, COM 375, MGMT 382, and OLS 346. Descriptions of these courses can be seen in Appendix M. The proposed plan of study was created without regard to specific university policies. Its purpose is to demonstrate the collection of courses that could potentially be selected to fulfill the learning objectives and competencies required by business analysts.

The creation of undergraduate versions of multiple graduate courses is recommended. This recommendation may be subject to university policy. Multiple graduate courses were selected to be included in the proposed plan of

study (Appendix M). Undergraduate versions of courses related to requirements management, organizational change management, business process redesign, organizational impact of IT, and IT economics should be developed.

Finally, the researcher recommends that an internship be required for completion of the proposed plan of study (Appendix M). Based on the judgment of the department administrators, the internship could take the place of one or more defined or selective courses. In the experience of the researcher, the knowledge and perspective gained from an internship makes the coursework more meaningful. Further research would be necessary to determine when during the plan of study internship should be required. Also, the CIT department would have to establish industry relationships to help students find business analyst related internships. Forming these relationships could promote a scenario where the hiring organization and CIT department could agree upon learning outcomes for the internship period. It is suggested that if an internship is created, each student have defined goals they must accomplish during their internship. Meetings between department professors, the student, and internship supervisor could be held during agreed upon intervals during the course of the internship to evaluate the student's progress.

The conclusions and recommendations drawn from the results of this study have also led to multiple suggestions for future research:

a) Conduct a survey of graduating CIT students to determine how well they feel the CIT program does in terms of preparing them to be a business analyst.

b) Survey business analysts to determine the skills and competencies that they deem are the most important to their jobs. Develop learning objectives based on the survey results and then compare to current CIT courses.
c) Investigate the opinion of IT recruiters regarding the creation of a business analyst concentration. Determine whether an IT recruiter would be more likely to pursue a graduate who had completed such a program.
d) Conduct a gap analysis including multiple departments within the university relative to the learning objectives in the master list to find out if a better plan of study for business analysis can be created.
e) Perform a gap analysis of CIT course learning objectives versus topics taught in the course. This would also examine the process by which learning objectives are defined, how learning objectives are updated, as well as how learning objectives are used within the department to measure a student's knowledge or skillset regarding topics and materials covered in a course.
f) Investigate the creation and offering of a capstone course within the CIT curriculum to satisfy unmapped learning objectives that focused on the application of knowledge and/or skills.
g) Survey female students to determine whether the creation of a business analyst concentration would increase their interest in the CIT department

h) Conduct a study to conclude whether a business analyst minor could be created from a subset of the courses identified in the proposed plan of study (Appendix M)

i) Survey business analysts to determine the degree to which technical skills are needed. Based on the findings determine whether a business analyst concentration could be created within a business school versus a technical school.

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LIST OF REFERENCES

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APPENDICES

Appendix A Data Collection Emails

RE: CIT Thesis Research - Course Goals and Learning Objectives

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From : John A Springer <jaspring@purdue.edu> Thu, Aug 15, 2013 01:12 PM

Subject : RE: CIT Thesis Research - Course Goals and Learning Objectives

To : Ryan T Quigley <rquigley@purdue.edu>

Here are the categories:
1: Use and apply information systems solutions
2: Understand and apply high-level tools and emerging technologies
3: Use and apply systems theory and concepts
4: Demonstrate independent critical thinking and problem solving skills
5: Understand and apply system development methodologies
6: Communicate effectively with customers, supervisors and peers, both orally and in writing
7: Work effectively in teams to achieve a common goal
8: Manage projects, change, resources, and conflict
9: Employ best practices and understand the need for continued, life-long learning

Thank you,
John
John A. Springer, Ph.D.
Associate Professor
Department of Computer and Information Technology
Purdue University
765-496-7582
jaspring@purdue.edu
www.purdue.edu
We are Purdue.
What we make moves the world forward.

-----Original Message-----
From: Ryan T Quigley [mailto:rquigley@purdue.edu]
Sent: Thursday, August 15, 2013 12:02 PM

To: Springer, John A
Subject: Re: CIT Thesis Research - Course Goals and Learning Objectives
Dr. Springer,
Thank you for forwarding me the Excel spreadsheet. After looking at the spreadsheet, I was not able to determine how the categories were being assigned to the learning objectives. Do you happen to have any documentation or key regarding what the category numbers represent?
Thanks,
Ryan Quigley
Graduate Student/Teaching Assistant
Computer and Information Technology
Purdue University
----- Original Message -----
From: "John A Springer" <jaspring@purdue.edu>
To: "Ryan T Quigley" <rquigley@purdue.edu>
Sent: Wednesday, August 14, 2013 9:56:11 PM
Subject: RE: CIT Thesis Research - Course Goals and Learning Objectives

Hi Ryan,
What I have is attached. We used "outcomes" and not "objectives"; however, these terms are really just a matter of perspective. I hope this helps.

Thank you,
John
John A. Springer, Ph.D.
Associate Professor
Department of Computer and Information Technology Purdue University
765-496-7582
jaspring@purdue.edu
www.purdue.edu
We are Purdue.
What we make moves the world forward.

-----Original Message-----
From: Ryan T Quigley [mailto:rquigley@purdue.edu]
Sent: Wednesday, August 14, 2013 8:09 PM
To: Springer, John A
Subject: Re: CIT Thesis Research - Course Goals and Learning Objectives

Dr. Springer,
Thanks for the prompt reply. I am working with Professor Dittman (chair), Professor Brewer, and Professor Whitten. If the Excel spreadsheet has the same information then that sounds like it will work out just fine for my needs.

Thanks,
Ryan Quigley
Graduate Student/Teaching Assistant
Computer and Information Technology
Purdue University

----- Original Message -----
From: "John A Springer" <jaspring@purdue.edu>
To: "Ryan T Quigley" <rquigley@purdue.edu>, ja@purdue.edu
Sent: Wednesday, August 14, 2013 7:52:20 PM
Subject: RE: CIT Thesis Research - Course Goals and Learning Objectives
Hi Ryan,
With whom are you working?
I should have the material you need, although the database containing these materials has been down. I think I have them offline in an Excel spreadsheet; would that work?

Thank you,
John
John A. Springer, Ph.D.
Associate Professor
Department of Computer and Information Technology Purdue University
765-496-7582
jaspring@purdue.edu
www.purdue.edu
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From: Ryan T Quigley [rquigley@purdue.edu]
Sent: Wednesday, August 14, 2013 7:27 PM
To: ja@purdue.edu
Subject: CIT Thesis Research - Course Goals and Learning Objectives

Professor Springer,
My thesis research question requires an analysis which includes an examination of the current CIT course offerings in terms of their course goals and stated learning objectives. I was told that I would need to reach out to you in order to acquire those materials. Could you please let me know what I need to do to get access to those materials for my research?
Thanks,
Ryan Quigley
Graduate Student/Teaching Assistant
Computer and Information Technology
Purdue University

CNIT 38301 Learning Objectives

From : Ryan T Quigley <rquigley@purdue.edu> Wed, Oct 09, 2013 07:34 PM
Subject : CNIT 38301 Learning Objectives
To : Jeffrey L. Whitten <jwhitten@purdue.edu>

Professor,

During the course of analysis for my thesis, I noticed that your packaged software applications course was not included in the list of courses and their learning objectives that I received from Dr. Springer. Could you please pass along the current learning objectives for the course when you have time?

Thanks,

Ryan Quigley
Graduate Student/Teaching Assistant
Computer and Information Technology
Purdue University

Re: CNIT 38301 Learning Objectives

From : Jeffrey L. Whitten <jwhitten@purdue.edu> Fri, Oct 11, 2013 11:20 AM

1 attachment

Subject : Re: CNIT 38301 Learning Objectives

To : Ryan T Quigley <rquigley@purdue.edu>

Course Learning Outcomes:

- 1. Describe characteristics of packaged application software solutions to enterprise and inter-enterprise problems and opportunities that meet transactional, operational, managerial and executive needs.
- 2. Understand the "make versus buy" software alternatives, criteria, and implications, including considerations for open source solutions.
- 3. Create and implement effective packaged application software project plans with regard to feasibility, risk, scope, time, cost, implementation services and organizational change.
- 4. Extend previously learned tools and techniques to collect, analyze, and transmit user to vendors the requirements for packaged application software solutions.
- 5. Use appropriate tools and techniques to solicit, assess, and contract for packaged application software solutions offered by vendors and foundations.
- 6. Use appropriate tools and techniques to install, configure, integrate, extend, and test packaged application software solutions.
- 7. Organize, write and/or analyze business and technical reports and communications that are specific to the selection and implementation of packaged application software solutions (e.g., Requests for Proposals, business cases, contracts).
- 8. Recognize the need for the application of analytical methods, critical thinking, and creative problem solving to the selection and implementation of packaged application software solutions.
- 9. Understand the expectations of an information technology professional assigned to a packaged application software project.

Students First!
Jeff Whitten
Professor, CIT
Chair, CIT Graduate Program
Knoy 245
765-494-2566 / 765-496-1212 fax
Jwhitten@purdue.edu

https://tech.purdue.edu/profile/jwhitten
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Request to reprint a figure from the ACM 2010 IS Model Curriculum

From : Deborah Cotton <cotton@hq.acm.org> Fri, Oct 25, 2013 02:25 PM
Subject : Request to reprint a figure from the ACM 2010 IS Model Curriculum 1 attachment
To : rquigley@purdue.edu

Dear Ryan,

Thanks for following up on your inquiry. I apologize for the apparent oversight of your request. I did not see a message from you to Permissions@acm.org, but it is possible that it went to spam. In that case, please forgive the delayed reply.

ACM is pleased to grant the permission you seek to reprint Fig. 6 from the IS 2010 Model Curriculum in your thesis. Please cite the source in the figure caption.

For future reference, please know that reprint permission for any ACM copyrighted article that appears in the ACM Digital Library may be licensed quickly through the RightsLink® online permission system (see attached for details).

Let me know if you need anything further, and good luck with your thesis.

Regards,

Deborah Cotton
Copyright & Permissions
ACM Publications
212.626.0652
cotton@hq.acm.org

----Original Message----
From: Ryan T Quigley [mailto:rquigley@purdue.edu]
Sent: Wednesday, October 23, 2013 12:30 PM
To: white@acm.org
Cc: goetz@acm.org; Emily Eng
Subject: ACM IS Model Curriculum - Figure Reproduction Copyright Permission Request

Mr. White,

I hope this email finds you well. My name is Ryan Quigley and I am a graduate student at Purdue University. I am currently working on a thesis focused around curricula for business analysis. I would like to request copyright permission to include Figure 6 (Structure of the IS 2010 Model Curriculum) from the IS 2010 Curriculum Guidelines in the final version of my thesis. I reached out to multiple people within your organization and have received no response. Could you please provide information on the process necessary to obtain that permission? Thank you for your time.

Regards,

Ryan Quigley
Graduate Student/Teaching Assistant
Computer and Information Technology
Purdue University

Appendix B IS 2010 Curriculum Guidelines for Undergraduate

Structure of the IS Model Curriculum:Information Systems specific courses

Career Track:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Core IS Courses:																	
Foundations of IS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Enterprise Architecture	○	●	○	○	○	●	○	○	○	○	●	○	○	○	●	○	○
IS Strategy, Management and Acquisition	○	●	○	○	○	●	○	○	●	○	●	○	○	○	●	○	○
Data and Information Management	●	○	○	●	●	○	○	●	●	○	●	○	●	○	○	○	○
Systems Analysis & Design	●	●	●	○	○	○	●	○	○	○	○	○	○	○	●	●	●
IT Infrastructure	○	○	○	●	○	○	○	●	●	●	○	○	●	●	○	○	○
IT Project Management	●	○	○	○	○	●	○	○	○	○	●	○	○	○	●	●	●
Elective IS Courses:																	
Application Development	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●
Business Process Management		●	●			○	○	○		○	●				○		
Collaborative Computing						○								○			○
Data Mining / Business Intelligence		●		●	●	○	○	○	●		○	○	○	○	○		○
Enterprise Systems		●	●	○	○	○	●	●	○		●	●	○	○			
Human-Computer Interaction	●					○	○				○					●	
Information Search and Retrieval		○		○	●								○				●
IT Audit and Controls	○		●	○	○	○	○	●		●	○		○	○	○		○
IT Security and Risk Management	○			○	○	○	○	●	●	○	○		●	●	○		○
Knowledge Management		●		○		○	○			○							
Social Informatics													○		○		

Key:

● = Significant Coverage

○ = Some Coverage

Blank Cell = Not Required

Figure B.1 IS Model Curriculum Structure (Topi et al., 2010, p. 52). Reproduced with permission.

Appendix C CIT Course Learning Objectives and Categories

CNIT Courses and Learning Objectives

	A	B	C	D
1	COURSE NUMBER	COURSE TITLE	Category Number	Learning Outcome Description
10	CNIT 155	Introduction to Object-Oriented Programming	2	Use the Integrated Development Environment (IDE) of Visual
11	CNIT 155	Introduction to Object-Oriented Programming	2	Design Graphical User Interface (GUI) that employ good design.
12	CNIT 155	Introduction to Object-Oriented Programming	3	Understand the importance of each step in the program development life cycle.
13	CNIT 155	Introduction to Object-Oriented Programming	4	Use selection, relational operators, and logical operators to change the program flow.
14	CNIT 155	Introduction to Object-Oriented Programming	4	Use common algorithms such as counting, accumulating, searching, sorting, and finding minimums, maximums, and averages.
15	CNIT 155	Introduction to Object-Oriented Programming	4	Enhance program modularity and code reuse by using methods in classes.
16	CNIT 155	Introduction to Object-Oriented Programming	4	Use conditional and counting loops.
17	CNIT 155	Introduction to Object-Oriented Programming	4	Validate input data.
18	CNIT 155	Introduction to Object-Oriented Programming	4	Use arrays and other types of collection structures to store multiple instances of data.
19	CNIT 155	Introduction to Object-Oriented Programming	4	Introduction to OOP concepts and terminology.
20	CNIT 155	Introduction to Object-Oriented Programming	4	Understand fundamental programming concepts.
21	CNIT 155	Introduction to Object-Oriented Programming	4	Introduction to OOP concepts using C#
22	CNIT 155	Introduction to Object-Oriented Programming	4	Use learned concepts: selection, data validation, loops, arrays to develop a solution for the given problem within the given time.
23	CNIT 155	Introduction to Object-Oriented Programming	4	Use arithmetic and string-related operators to manipulate data.
24	CNIT 155	Introduction to Object-Oriented Programming	4	Use variables, constants, objects, classes and data types.
25	CNIT 155	Introduction to Object-Oriented Programming	5	Know and use program debugging and testing
26	CNIT 155	Introduction to Object-Oriented Programming	5	Know and follow organizational source code programming standards and guidelines.
27	CNIT 155	Introduction to Object-Oriented Programming	6	Include comments in each program to document the author's name, brief description of the problem, and solution logic.
28	CNIT 155	Introduction to Object-Oriented Programming	9	Take responsibility for attending class sessions.

29	CNIT 175	Visual Programming	2	Use Visual Studio.NET IDE to create, compile, run, and debug
30	CNIT 175	Visual Programming	4	Apply problem solving to develop the step by step algorithm to solve a problem.
31	CNIT 175	Visual Programming	4	Use proper data type and scope for variables.
32	CNIT 175	Visual Programming	4	Know how to use arithmetic operators and translate formulas.
33	CNIT 175	Visual Programming	4	Use Selection in the program.
34	CNIT 175	Visual Programming	4	Know how to validate the user's input.
35	CNIT 175	Visual Programming	4	Know how to use modularity in a program.
36	CNIT 175	Visual Programming	4	Know how to use Repetition or loops to solve a problem.
37	CNIT 175	Visual Programming	4	Know when to use one-dimensional arrays.
38	CNIT 175	Visual Programming	4	Know how to use abstract data type, Structure.
39	CNIT 175	Visual Programming	4	Know how to read or write to a text file.
40	CNIT 175	Visual Programming	5	Use VB .NET IDE to test and debug the program.
41	CNIT 175	Visual Programming	6	Document author's name, solution logic, and other information, via comments in the source
42	CNIT 175	Visual Programming	9	Follow the taught coding standards in all the programs developed in this course.
43	CNIT 175	Visual Programming	9	Understand the consequences of academic dishonesty.
44	CNIT 175	Visual Programming	9	Apply time management to deliver work within the
45	CNIT 175	Visual Programming	9	Attend the lab sessions.
46	CNIT 176	Information Technology Architectures	1	Explain how business problems can be solved through the proper application of technology.
47	CNIT 176	Information Technology Architectures	2	Understand and describe the interoperability of various architectural components.
48	CNIT 176	Information Technology Architectures	2	Understand and describe distributed systems architecture.
49	CNIT 176	Information Technology Architectures	2	Understand and describe operating system and network operating system architectures.
50	CNIT 176	Information Technology Architectures	2	Understand and describe application development architecture and methodologies.
51	CNIT 176	Information Technology Architectures	3	Demonstrate an understanding of the role of interfaces, protocols, APIs, and middleware as required to deliver end-to- end compatibility in information system.
52	CNIT 176	Information Technology Architectures	5	Understand the processes and functions by which software is implemented in current information

53	CNIT 176	Information Technology Architectures	6	Research and detail technical and/or business implications of existing information technology architectures or their constituent components.
54	CNIT 180	Introduction To Systems Development	1	Describe the purpose and organization of common business functions, processes, opportunities for automation, and information services.
55	CNIT 180	Introduction To Systems Development	2	Manage applications and technology with high-level tools and methodologies.
56	CNIT 180	Introduction To Systems Development	3	Apply system representations and life cycle concepts.
57	CNIT 180	Introduction To Systems Development	3	Understand and identify the environment, boundaries, interfaces, and components of information systems.
58	CNIT 180	Introduction To Systems Development	3	Understand information systems architectures and their implementation.
59	CNIT 180	Introduction To Systems Development	3	Describe process modeling concepts and tools, including data flow diagrams, a data dictionary, and process descriptions.
60	CNIT 180	Introduction To Systems Development	3	Define object modeling terms and concepts, including objects, attributes, methods, messages, classes, inheritance, and instances. Describe Unified Modeling Language (UML) tools and techniques, including use cases, use case diagrams, class diagrams, and activity diagrams.
61	CNIT 180	Introduction To Systems Development	3	Explain data design concepts and structures, database systems and define its components. Explain data design terminology, including entities, fields, records, files, tables and keys. Describe data relationships, draw entity relationship diagrams (ERD's), define cardinality, and explain normalization.
62	CNIT 180	Introduction To Systems Development	4	Devise questions that will identify and evaluate problems, opportunities, constraints, and alternative solutions.
63	CNIT 180	Introduction To Systems Development	5	Use appropriate tools and techniques to plan, analyze, design, and construct information systems.
64	CNIT 180	Introduction To Systems Development	5	Employ effective testing methodologies.
65	CNIT 180	Introduction To Systems Development	5	Select and utilize systems development and integration methodologies that are compatible with organizational settings.
66	CNIT 180	Introduction To Systems Development	8	Plan, specify, gather, deploy, monitor, and direct resources and activities.

67	CNIT 242	Systems Administration	2	Understand and perform system administration tasks such as authentication, file sharing, backup, printing
68	CNIT 242	Systems Administration	2	Understand, implement, and maintain virtual computing environments
69	CNIT 242	Systems Administration	4	Research and solve hardware and software implementation problems in laboratory projects
70	CNIT 242	Systems Administration	6	Produce written reports that document project work performed in the laboratory
71	CNIT 242	Systems Administration	7	Work cooperatively as a team to implement solutions
72	CNIT 242	Systems Administration	8	Develop a project plan and execute its delivery
103	CNIT 272	Database Fundamentals	1	Recognize the significant role that data and databases play in the information system solutions.
104	CNIT 272	Database Fundamentals	1	Employ principles in developing a database solution for a business problem.
105	CNIT 272	Database Fundamentals	1	Describe the varying data, information, and knowledge needs for personal, workgroup, enterprise, inter-enterprise and global information systems.
106	CNIT 272	Database Fundamentals	1	Explain how a database and its application support a business operation or function.

107	CNIT 272	Database Fundamentals	1	Know the scope, complexity, and implications of data, information, and knowledge management for an enterprise solution.
108	CNIT 272	Database Fundamentals	2	Apply appropriate personal and/or workgroup database software to a specified business problem.
109	CNIT 272	Database Fundamentals	2	Develop various models using CASE technology or other modeling software for database design.
110	CNIT 272	Database Fundamentals	2	Demonstrate an understanding of the hardware, software, communications, and network fundamentals.
111	CNIT 272	Database Fundamentals	3	Construct Class or Entity Relationship Attribute models for
112	CNIT 272	Database Fundamentals	3	Apply concepts from conceptual to logical to physical implementations of data for a business function.
113	CNIT 272	Database Fundamentals	3	Test and verify that the solution (application and

114	CNIT 272	Database Fundamentals	3	Evaluate and demonstrate appropriate integration of the life cycle of data in terms of the Systems Development Life Cycle, its process, and database application.
115	CNIT 272	Database Fundamentals	4	Identify the characteristics or properties of data and data structures which impact database design.
116	CNIT 272	Database Fundamentals	4	Apply database design techniques and confirmation mechanisms (such as normalization) to business data problems.
117	CNIT 272	Database Fundamentals	4	Recognize the need for applying system development life cycle to create well-structured information systems.
118	CNIT 272	Database Fundamentals	4	Analyze and design a Class or ERD that provides an information system that meets the business requirements.
119	CNIT 272	Database Fundamentals	4	Apply problem-solving approaches to identify data entities, processes, and interfaces to be implemented as application components.
120	CNIT 272	Database Fundamentals	5	Develop fully attributed logical and physical data models.
121	CNIT 272	Database Fundamentals	5	Model business rules for a database using the following constructs: Sentences describing relationships, Classes or Entities, Attributes, Domains, Relationships (with cardinality), Design and develop logical model, Design and develop physical model, Generate the DDL.
122	CNIT 272	Database Fundamentals	5	Understand (at a high level) the data definition language (DDL) generated by a physical database design.
123	CNIT 272	Database Fundamentals	5	Apply normalization rules to the 3rd Normal form.
124	CNIT 272	Database Fundamentals	5	Understand data manipulation language (DML) for altering, querying, and deleting within a database.
125	CNIT 272	Database Fundamentals	5	Use class or entity-relationship tools and techniques to analyze and design a database.
126	CNIT 272	Database Fundamentals	6	Demonstrate an ability to create and present written or oral reports.
127	CNIT 272	Database Fundamentals	6	Schedule and organize team meetings to monitor progress of project development.
128	CNIT 272	Database Fundamentals	6	Understand the dynamics and tools of organizing teams and holding group meetings.
129	CNIT 272	Database Fundamentals	6	Develop project documentation, including application and database design.

130	CNIT 272	Database Fundamentals	7	Demonstrate an ability to work effectively as a member of a team.
131	CNIT 272	Database Fundamentals	8	Demonstrate an ability to work effectively as a member of a team.
132	CNIT 272	Database Fundamentals	8	Understand why information goals must be aligned and consistent with organizational goals.
133	CNIT 272	Database Fundamentals	9	Explain the good and bad ways that technology has and can change organizations and society.

134	CNIT 272	Database Fundamentals	9	Demonstrate an understanding of best practices in conceptual/logical/physical data modeling, data storage, and data retrieval.
135	CNIT 272	Database Fundamentals	9	Understand ethical issues involved in the use of information systems and the complexity of the issues.
136	CNIT 272	Database Fundamentals	9	Practice adherence to standards of academic honesty.
137	CNIT 280	Systems Analysis And Design Methods	2	Identify and apply appropriate tools for modeling and implementing various systems aspects.
138	CNIT 280	Systems Analysis And Design Methods	3	Identify, evaluate, and model system boundaries and interfaces for a system.
139	CNIT 280	Systems Analysis And Design Methods	3	Apply use case and object modeling using UML to a systems project.
140	CNIT 280	Systems Analysis And Design Methods	4	Using the systems concepts and the PIECES framework, develop a fact-finding strategy (including interviewing and questionnaires) to obtain and verify facts from a user(s).
141	CNIT 280	Systems Analysis And Design Methods	4	Understand the SDLC as an analytical problem solving approach to systems development.
142	CNIT 280	Systems Analysis And Design Methods	5	Apply systems development tools and techniques during various stages of systems development.
143	CNIT 280	Systems Analysis And Design Methods	5	Understand the difference between a 'systems development life cycle' and a 'systems development methodology'.
144	CNIT 280	Systems Analysis And Design Methods	5	Identify and analyze problems and opportunities for an existing information system.
145	CNIT 280	Systems Analysis And Design Methods	6	Write memos, reports, and documentation appropriate during systems development project experience.
146	CNIT 280	Systems Analysis And Design Methods	6	Understand how to plan, organize, and facilitate group meetings and joint application development sessions for a systems development project.

147	CNIT 280	Systems Analysis And Design Methods	7	Identify various people and their roles in systems development and the need to establish project development teams.
148	CNIT 280	Systems Analysis And Design Methods	7	Recognize systems development as requiring strong interpersonal skills for working with people of diverse backgrounds.
149	CNIT 280	Systems Analysis And Design Methods	8	Recognize the need to manage change, expectations, and conflict during systems development projects.
150	CNIT 280	Systems Analysis And Design Methods	8	Understand the need for user involvement and requirements verification, systems testing and user feedback mechanisms.
151	CNIT 280	Systems Analysis And Design Methods	9	Apply personal decision making skills in a systems development setting.
152	CNIT 280	Systems Analysis And Design Methods	9	Apply personal goal setting and time management concepts in a systems development setting.
153	CNIT 280	Systems Analysis And Design Methods	9	Develop a sense of personal responsibility and accountability for one's individual actions and performance.
154	CNIT 321	Enterprise Social Media and Global IT	1	Understand current technology and trends within the enterprise social media area
155	CNIT 321	Enterprise Social Media and Global IT	6	Research, analyze, report and communicate on specific global issues related to IT and collaborative technologies.
156	CNIT 321	Enterprise Social Media and Global IT	7	Review social media sites and see how companies have responded to customer complaints.
157	CNIT 321	Enterprise Social Media and Global IT	9	Develop an understanding of various cultures.
207	CNIT 380	Advanced Analysis and Design	2	Develop a proposed systems development project plan and a systems design document.
208	CNIT 380	Advanced Analysis and Design	2	Identify and apply appropriate tools for modeling and implementing various systems aspects.
209	CNIT 380	Advanced Analysis and Design	2	Prepare a systems requirements document.
210	CNIT 380	Advanced Analysis and Design	3	Apply use case and object modeling using UML to a systems project.
211	CNIT 380	Advanced Analysis and Design	3	Identify, evaluate, and model system boundaries and interfaces for a system.
212	CNIT 380	Advanced Analysis and Design	4	Understand the SDLC as an analytical problem solving approach to systems development.
213	CNIT 380	Advanced Analysis and Design	4	Develop a system concept based on a given set of system requirements.

214	CNIT 380	Advanced Analysis and Design	5	Identify and analyze problems and opportunities for an existing information system.
215	CNIT 380	Advanced Analysis and Design	5	Apply systems development tools and techniques during various stages of systems development.
216	CNIT 380	Advanced Analysis and Design	6	Write memos, reports, and documentation appropriate during systems development project experience.
217	CNIT 380	Advanced Analysis and Design	6	Understand how to plan, organize, and facilitate group meetings and joint application development sessions for a systems development project.
218	CNIT 380	Advanced Analysis and Design	7	Identify various people and their roles in systems development and the need to establish project development teams.
219	CNIT 380	Advanced Analysis and Design	7	Recognize systems development as requiring strong interpersonal skills for working with people of diverse backgrounds.
220	CNIT 380	Advanced Analysis and Design	8	Understand the need for user involvement and requirements verification, systems testing and user feedback mechanisms.
221	CNIT 380	Advanced Analysis and Design	8	Recognize the need to manage change, expectations, and conflict during systems development projects.
222	CNIT 380	Advanced Analysis and Design	9	Apply personal goal setting and time management concepts in a systems development setting.
223	CNIT 380	Advanced Analysis and Design	9	Apply personal decision making skills in a systems development setting.
224	CNIT 380	Advanced Analysis and Design	9	Develop a sense of personal responsibility and accountability for one's individual actions and
225	CNIT 399ISV	Software as a Business	2	Gain experience designing and developing an innovative software product.
226	CNIT 399ISV	Software as a Business	2	Know options for marketing and advertising using web services.
227	CNIT 399ISV	Software as a Business	4	Know the importance of being innovative.
228	CNIT 399ISV	Software as a Business	5	Know how to protect software-based intellectual
229	CNIT 399ISV	Software as a Business	5	Know the concerns IP ownership and licensing related to
230	CNIT 399ISV	Software as a Business	5	Know options related to monetizing software applications.
231	CNIT 399ISV	Software as a Business	5	Know pros and cons of using open-source software in new technologies.

232	CNIT 399ISV	Software as a Business	6	Know how to prepare a presentation to present to potential investors.
233	CNIT 399ISV	Software as a Business	7	Begin the process of creating a technology start-up
234	CNIT 399ISV	Software as a Business	8	Know options for getting computer software applications developed.
235	CNIT 399ISV	Software as a Business	8	Know the types and costs of office space available in the local area.
236	CNIT 405	Software Development Methodologies	5	Understand and be able to implement requirements traceability to software modules.
237	CNIT 405	Software Development Methodologies	5	Analyze and evaluate the various software development methodologies available.
238	CNIT 405	Software Development Methodologies	5	Understand and be able to implement software testing procedures.
239	CNIT 405	Software Development Methodologies	6	Produce reports or presentations detailing the proper implementation of a software development methodology or technology.
240	CNIT 405	Software Development Methodologies	8	Understand software quality concepts and the processes required to ensure software quality.
241	CNIT 405	Software Development Methodologies	8	Identify, monitor, and document the risks involved with software and software development.
242	CNIT 405	Software Development Methodologies	8	Understand change management as applied to software, including software change requests, version control, and configuration management.
243	CNIT 405	Software Development Methodologies	8	Understand software project, process and product metrics.
244	CNIT 405	Software Development Methodologies	9	Understand intellectual property rights as applied to software.
245	CNIT 405	Software Development Methodologies	9	Understand the issues of accountability, responsibility, and certification as they apply to software
329	CNIT 480	Managing Information Technology Projects	1	Differentiate between information systems, approaches, and people involved in running projects that support: individuals, work groups, organizations, and multiple organizations.
330	CNIT 480	Managing Information Technology Projects	1	Experience applying project management principles to different organizational structures.
331	CNIT 480	Managing Information Technology Projects	2	Study types of contracts and procurement documents, and how they apply for different technologies.

332	CNIT 480	Managing Information Technology Projects	2	Evaluate the purchasing cycle from a project management perspective.
333	CNIT 480	Managing Information Technology Projects	2	Utilize project management software to develop a proposed systems development project plan.
334	CNIT 480	Managing Information Technology Projects	3	Understand how to approach projects using a systems
335	CNIT 480	Managing Information Technology Projects	3	Demonstrate an understanding of a project management life cycle process applied to systems projects involving both purchased and build from scratch solutions.
336	CNIT 480	Managing Information Technology Projects	3	Identify, evaluate, and model system boundaries and interfaces for a system.
337	CNIT 480	Managing Information Technology Projects	4	Understand how to make changes to a project schedule using project management software based on real world problems that occur during the execution of a project.
338	CNIT 480	Managing Information Technology Projects	4	Use brainstorming to create a list of potential risks to a project meeting stated goals of scope, time, and cost.
339	CNIT 480	Managing Information Technology Projects	4	Apply systems theory and concepts, and problem solving approaches to an information systems
340	CNIT 480	Managing Information Technology Projects	4	Understand the process of creating a work breakdown structure using several methods.
341	CNIT 480	Managing Information Technology Projects	5	Understand the concept of 'make versus buy' and apply those principles when producing the project plan.
342	CNIT 480	Managing Information Technology Projects	5	Understand what type of methodology to apply to a project based on organizational culture.
343	CNIT 480	Managing Information Technology Projects	5	Identify and analyze issues with a project schedule which delivers a product from a real business case study.
344	CNIT 480	Managing Information Technology Projects	5	Apply from a project management perspective tools and techniques which aid the process of building a product using a systems development methodology.
345	CNIT 480	Managing Information Technology Projects	5	Recognize the existence of alternative systems development tools, techniques, and approaches.
346	CNIT 480	Managing Information Technology Projects	6	Understand the need and importance of oral presentations to non-technical audiences during a systems development project.

347	CNIT 480	Managing Information Technology Projects	6	Write memos, reports, and documentation appropriate during systems development project
348	CNIT 480	Managing Information Technology Projects	6	Develop a fact-finding strategy to aid in the understanding of a business case study.
349	CNIT 480	Managing Information Technology Projects	7	Learn techniques to become better listeners and seek synergistic information systems solutions.
350	CNIT 480	Managing Information Technology Projects	7	Understand how 'win-win' approaches can be used to resolve conflict resolution on IT projects.
351	CNIT 480	Managing Information Technology Projects	7	Differentiate between different knowledge workers and their needs.
352	CNIT 480	Managing Information Technology Projects	7	Understand team dynamics in information technology projects.
353	CNIT 480	Managing Information Technology Projects	7	Recognize IT projects as requiring strong interpersonal skills for working with people of diverse backgrounds.
354	CNIT 480	Managing Information Technology Projects	7	Identify various people and their roles in systems development and the need to establish project development teams.
355	CNIT 480	Managing Information Technology Projects	8	Develop a complete project plan for an IT project.

356	CNIT 480	Managing Information Technology Projects	8	Learn tools and techniques needed during the execution of the project: quality assurance, team development, status communication, procurement processes.
357	CNIT 480	Managing Information Technology Projects	8	Establish IT project goals consistent with organizational goals.
358	CNIT 480	Managing Information Technology Projects	8	Understand the strategic planning process at the organizational level and department level.
359	CNIT 480	Managing Information Technology Projects	8	Recognize the need to manage change, expectations, and conflict during IT development projects.
360	CNIT 480	Managing Information Technology Projects	8	Develop effective project plans to deliver a system that meets customer expectations for functionality, quality, timeliness, and cost.
361	CNIT 480	Managing Information Technology Projects	8	Understand the need for user involvement and requirements verification, systems testing and user feedback mechanisms.

362	CNIT 480	Managing Information Technology Projects	9	Students are given a course calendar early in the semester which contains all dates of exams and assignments and lectures. Students must learn to budget their time accordingly.
363	CNIT 480	Managing Information Technology Projects	9	Assess organizational and societal impacts of a particular information system or technology.
364	CNIT 480	Managing Information Technology Projects	9	Apply personal goal setting and time management concepts in a systems development setting.
365	CNIT 480	Managing Information Technology Projects	9	Understand the ethical issues of project management and systems development and adhere to ethical standards.
366	CNIT 487	Database Administration	1	Explain interaction of database management system with technology that supports information systems.
367	CNIT 487	Database Administration	1	Become familiar with best practices in database administration.
368	CNIT 487	Database Administration	1	Describe the manner in which database administration plays a role in information system solutions.
369	CNIT 487	Database Administration	2	Install a distributed database.
370	CNIT 487	Database Administration	2	Describe the architecture of a distributed database management system with regard to process, memory, and storage
371	CNIT 487	Database Administration	2	Identify tools and methods to install, create, manage, and monitor the performance of a database management system.
372	CNIT 487	Database Administration	3	Demonstrate implementation and administration concepts for operational (transaction processing) databases.
373	CNIT 487	Database Administration	4	Analyze requirements and constraints for the purpose of installing, configuring, and tuning a database
374	CNIT 487	Database Administration	4	Develop a backup and recovery plan for a production database
375	CNIT 487	Database Administration	5	Apply the natural progression from physical data model to full database implementation and operation.
376	CNIT 487	Database Administration	5	Select and utilize appropriate methods and tools for database administration.
377	CNIT 487	Database Administration	6	Document the development and implementation of a new database or operating an existing one.
378	CNIT 487	Database Administration	7	Effectively work with people of diverse technological backgrounds on a project.

379	CNIT 487	Database Administration	7	Demonstrate an ability to work as a member of a team.
380	CNIT 487	Database Administration	8	Demonstrate an ability to implement a new database solution by using a project plan.
381	CNIT 487	Database Administration	8	Understand database administration productivity tools and techniques that can contribute to continuous quality improvements in database usability, adaptability and extensibility.
382	CNIT 487	Database Administration	9	Apply personal decision making skills to meet personal and team goals
383	CNIT 487	Database Administration	9	Understand the ethical issues of database design and adhere to ethical standards in a project.
384	CNIT 487	Database Administration	9	Apply personal goal setting and time management concepts in a database administration setting.
385	CNIT 487	Database Administration	9	Practice adherence to standards of academic honesty
386	CNIT 488	Data Warehousing	1	Understand the key characteristics of managerial data and decision support processes and how data warehouses support those functions.
387	CNIT 488	Data Warehousing	1	Explain how a data warehouse and its application support a business operation or function.
388	CNIT 488	Data Warehousing	2	Develop various models using CASE technology or other modeling software for data warehouse design.
389	CNIT 488	Data Warehousing	2	Apply appropriate hardware and software tools for data warehouses.
390	CNIT 488	Data Warehousing	3	Construct models for designing effective and efficient data warehouses.
391	CNIT 488	Data Warehousing	4	Analyze and design a data warehouse based on business requirements.
392	CNIT 488	Data Warehousing	4	Create and demonstrate how a data warehouse solution solves a business problem.
393	CNIT 488	Data Warehousing	4	Identify the characteristics or properties of good data warehouse architecture.
394	CNIT 488	Data Warehousing	4	Evaluate and optimize performance characteristics of a data warehouse.
395	CNIT 488	Data Warehousing	5	Use entity-relationship tools and techniques to analyze and design a data warehouse.
396	CNIT 488	Data Warehousing	5	Test and verify that a data warehouse solution (design and implementation) provided meets the business

397	CNIT 488	Data Warehousing	5	Understand and employ methods for creating effective
398	CNIT 488	Data Warehousing	5	Understand and employ methods for creating effective
399	CNIT 488	Data Warehousing	6	Develop project documentation, including application and data warehouse design.
400	CNIT 488	Data Warehousing	7	Demonstrate an ability to work effectively as a member of a team.
401	CNIT 488	Data Warehousing	8	Understand why the purpose and function of a data warehouse must be aligned and consistent with organizational goals.
402	CNIT 488	Data Warehousing	9	Practice adherence to standards of academic honesty.
423	CNIT 38301	Packaged Software Applications		Describe characteristics of packaged application software solutions to enterprise and inter-enterprise problems and opportunities that meet transactional, operational, managerial and executive needs
424	CNIT 38301	Packaged Software Applications		Understand the "make versus buy" software alternatives, criteria, and implications, including considerations for open source solutions
425	CNIT 38301	Packaged Software Applications		Create and implement effective packaged application software project plans with regard to feasibility, risk, scope, time, cost, implementation services and organizational change
426	CNIT 38301	Packaged Software Applications		Extend previously learned tools and techniques to collect, analyze, and transmit user to vendors the requirements for packaged application software solutions
427	CNIT 38301	Packaged Software Applications		Use appropriate tools and techniques to solicit, assess, and contract for packaged application software solutions offered by vendors and foundations
428	CNIT 38301	Packaged Software Applications		Use appropriate tools and techniques to install, configure, integrate, extend, and test packaged application software solutions
429	CNIT 38301	Packaged Software Applications		Organize, write and/or analyze business and technical reports and communications that are specific to the selection and implementation of packaged application software solutions (e.g., Requests for Proposals, business cases, contracts)

430	CNIT 38301	Packaged Software Applications		Recognize the need for the application of analytical methods, critical thinking, and creative problem solving to the selection and implementation of packaged application software solutions
431	CNIT 38301	Packaged Software Applications		Understand the expectations of an information technology professional assigned to a packaged application software project

Categories for Learning Objectives

Number	Category
1	Use and apply information systems solutions
2	Understand and apply high-level tools and emerging technologies
3	Use and apply systems theory and concepts
4	Demonstrate independent critical thinking and problem solving skills
5	Understand and apply system development methodologies
6	Communicate effectively with customers, supervisors and peers, both orally and in writing
7	Work effectively in teams to achieve a common goal
8	Manage projects, change, resources, and conflict
9	Employ best practices and understand the need for continued, life-long learning

Appendix D IS Model Curriculum Learning Objectives

	A	B
1	**Course**	**Learning Objective**
2	**Foundations of Information Systems**	Understand how and why information systems are used today.
3		Explain the technology, people, and organizational components of information
4		Understand globalization and the role information systems has played in this
5		Understand how businesses are using information systems for competitive advantage vs. competitive necessity
6		Understand the value of information systems investments as well as learn to formulate a business case for a new information system, including estimation of
7		Know the major components of an information systems infrastructure
8		Mitigate risks as well as plan for and recover from disasters.
9		Understand how information systems are enabling new forms of commerce between individuals, organizations, and governments
10		Be aware of emerging technologies that enable new forms of communication, collaboration, and partnering
11		Understand how various types of information systems provide the information needed to gain business intelligence to support the decision making for the different levels and functions of the organization.
12		Understand how enterprise systems foster stronger relationships with customers and suppliers and how these systems are widely used to enforce organizational structures and processes
13		Understand how organizations develop and acquire information systems and
14		Understand how to secure information systems resources, focusing on both human and technological safeguards
15		Evaluate the ethical concerns that information systems raise in society and the impact of information systems on crime, terrorism, and war
16		
17	**Data and Information Management**	Understand the role of databases and database management systems in managing organizational data and information.
18		Understand the historical development of database management systems and logical data models
19		Understand the basics of how data is physically stored and accessed.
20		Understand the fundamentals of the basic file organization techniques.
21		Apply information requirements specification processes in the broader systems
22		Use at least one conceptual data modeling technique (such as entity-relationship modeling) to capture the information requirements for an enterprise domain.
23		Link to each other the results of data/information modeling and process modeling.
24		Design high-quality relational databases
25		Understand the purpose and principles of normalizing a relational database
26		Design a relational database so that it is at least in 3NF.
27		Implement a relational database design using an industrial-strength database management system, including the principles of data type selection and

28		Use the data definition, data manipulation, and data control language components of SQL in the context of one widely used implementation of the
29		Perform simple database administration tasks.
30		Understand the concept of database transaction and apply it appropriately to an application context.
31		Understand the basic mechanisms for accessing relational databases from various types of application development environments.
32		Understand the role of databases and database management systems in the context of enterprise systems

33		Understand the key principles of data security and identify data security risk and violations in
34		Understand the core concepts of data quality and their application in an organizational context
35		Understand the difference between on-line transaction processing (OLTP) and online analytic processing (OLAP), and the relationship between these concepts and business intelligence, data warehousing and data mining
36		Create a simple data warehouse (“data mart”).
37		Understand how structured, semi-structured, and unstructured data are all essential elements of enterprise information and knowledge management. In this context, the students will learn the principles of enterprise search.
38		
39	**Enterprise Architecture**	Understand a variety of frameworks for enterprise architecture analysis and
40		Evaluate the total cost of ownership and return on investment for architecture
41		Utilize techniques for assessing and managing risk across the portfolio of the
42		Evaluate and plan for the integration of emerging technologies
43		Administer systems, including the use of virtualization and monitoring, power and cooling issues
44		Manage proliferating types and volume of content
45		
46		Understand the core concepts of data/information architecture and evaluate existing data/information architecture designs
47		Plan for business continuity
48		Understand the benefits and risks of service oriented architecture.
49		Understand the role of audit and compliance in enterprise architecture
50		Understand the integration of enterprise systems with interorganizational partners such as suppliers, government, etc.
51		
52	**Project Management**	Initiate, specify, and prioritize information systems projects and to determine various aspects of feasibility of these projects
53		Understand the foundations of project management, including its definition, scope, and the need for project management in the modern organization
54		Understand the phases of the project management lifecycle.
55		Manage project teams, including the fundamentals of leadership and team
56		Manage project communication, both internal to the team, and external to other project stakeholders
57		Initiate projects, including project selection and defining project scope
58		Manage project schedules with appropriate techniques and tools.

59		Manage project resources, including human resources, capital equipment, and
60		Manage project quality, including the identification of the threats to project quality, techniques for measuring project quality, and the techniques for ensuring project quality is achieved
61		Manage project risk, including the identification of project risk, and the techniques for ensuring project risk is controlled
62		Manage the project procurement process, including understanding external acquisition and outsourcing, as well as the steps for managing external
63		Manage project execution, including monitoring project progress and managing project change, and appropriately documenting and
64		Control projects through information tracking and cost and change control
65		Close projects, including administrative, personnel, and contractual closure.

66		Understand the mechanisms for dealing with legal issues in complex project
67		Appreciate ethnic cultural differences in working with global teams either internal to organizations or by engaging offshore outsourcers
68		
69	**Systems Analysis & Design**	Understand the types of business needs that can be addressed using information technology- based solutions
70		Initiate, specify, and prioritize information systems projects and to determine various aspects of feasibility of these projects
71		Clearly define problems, opportunities, or mandates that initiate projects.
72		Use at least one specific methodology for analyzing a business situation (a problem or opportunity), modeling it using a formal technique, and specifying requirements for a system that enables a productive change in a way the business is conducted
73		Within the context of the methodologies they learn, write clear and concise business requirements documents and convert them into
74		Communicate effectively with various organizational stakeholders to collect information using a variety of techniques and to convey proposed solution
75		Manage information systems projects using formal project management methods.
76		Articulate various systems acquisition alternatives, including the use of packaged systems (such as ERP, CRM, SCM, etc.) and outsourced design and development resources.
77		Use contemporary CASE tools for the use in process and data modeling
78		Compare the acquisition alternatives systematically
79		Incorporate principles leading to high levels of security and user experience from the beginning of the systems development process
80		Design high-level logical system characteristics (user interface design, design of data and information requirements).
81		Analyze and articulate ethical, cultural, and legal issues and their feasibilities among alternative solutions
82		

83	**IS Strategy, Management & Acquisition**	Understand the various functions and activities within the information systems area, including the role of IT management and the CIO, structuring of IS management within an organization, and managing IS professionals within
84		View an organization through the lens of non-IT senior management in deciding how information systems enable core and supportive business processes as well as those that interface with suppliers and customers
85		Understand the concepts of information economics at the enterprise level.
86		Appreciate how IS represents a key source of competitive advantage for firms.
87		Structure IS-related activities to maximize the business value of IS within and outside the company.
88		Understand existing and emerging information technologies, the functions of IS and its impact on the organizational operations
89		Evaluate the issues and challenges associated with successfully and unsuccessfully incorporating IS into a firm.
90		Understand how strategic decisions are made concerning acquiring IS resources and capabilities including the ability to evaluate the different
91		Apply information to the needs of different industries and areas
92		Understand the role of IT control and service management frameworks from the perspective of managing the IS function in an organization
93		
94	**Application Development**	Use primitive data types and data structures offered by the development
95		Choose an appropriate data structure for modeling a simple problem
96		Understand basic programming concepts

97		Write simple applications that relate to a specific domain
98		Design, implement, test, and debug a program that uses each of the following fundamental programming constructs: basic computation, simple I/O, standard conditional and iterative structures, and the definition of functions
99		Test applications with sample data
100		Apply core program control structures
101		
102	**Business Process Management**	Model business processes
103		Benchmark business processes performance
104		Assess business processes performance
105		Design business process improvements
106		Understand the role and potential of IT to support business process management
107		Understand the challenges of business process change
108		Understand how to support business process change
109		Understand different approaches to business process modeling and improvement
110		Understand the challenges and risks concerning business process outsourcing, especially those dealing with ethnic cultural differences from
111		Use basic business process modeling tools
112		Simulate simple business processes and use simulation results in business process
113		
114	**Enterprise Systems**	Understand the fundamentals of enterprise systems and issues associated with their implementation
115		Evaluate the costs and benefits of implementing an enterprise system
116		Understand how enterprise systems integrate functional areas into one enterprise wide information system.
117		Explain how “best practices” are incorporated in enterprise systems

118		Recognize how an organizational process often spans different functional areas
119		Describe the role of enterprise systems in carrying out processes in an organization
120		Learn to integrate key concepts from functional-oriented courses, such as accounting, marketing, and organizational behavior, to promote the development of integrative skills
121		Explain how integrated information sharing increases organizational efficiencies
122		Identify, describe, and evaluate the major enterprise system software providers and their packaged systems.
123		Understand current trends related to enterprise systems

(Topi et al., 2010, p. 35-70)

Appendix E IT Model Curriculum Learning Objectives

	A	B
1	**(Knowledge Area) Course**	**Learning Objective**
2	**(ITF) Pervasive Themes in IT**	Explain how the components of an IT system interrelate.
3		Explain how and why complexity occurs in IT.
4		Manage complexity in an information technology environment by applying best practices and using appropriate technologies and methodologies
5		Describe the role of the IT professional as the user advocate.
6		Explain why life-long learning and continued professional development is critical for an IT professional
7		Explain why adaptability and interpersonal skills are important to an IT professional.
8		Explain the difference between a concept and the possible representations of that concept: for example, the relationship between information and data.
9		Illustrate the use of information and communication technologies to solve problems as an IT professional
10		Explain why the IAS perspective needs to pervade all aspects of
11		Explain how organizational context is influenced by and impacts the development and deployment of IT systems.
12		
13	**(ITF) History of IT**	Outline the history of computing technology, the Internet, and the World-Wide Web
14		Explain how computing and society impact one another.
15		
16	**(ITF) IT and Its Related and Informing Disciplines**	Explain the relationship between IT and related and informing disciplines.
17		
18	**(ITF)Application Domains**	Explain how and to what extent IT has changed various application domains.
19		Explain how IT has impacted the globalization of world economy, culture, political systems, health, security, warfare, etc
20		
21	**(HCI) Human Factors**	Describe the relationship between the cognitive principles and their application to interfaces and products

22		Explain the conceptual terms for analyzing human interaction with products such as affordance, conceptual model, and feedback
23		Analyze different user populations with regard to their abilities and characteristics for using both software and hardware products
24		Explain the importance of user abilities and characteristics in the usability of products.
25		

26	**(HCI) HCI Aspects of Application Domains**	Describe different types of interactive environments
27		Describe the differences in developing user interfaces for different application environments (e.g., Web pages, standalone applications, etc.).
28		Describe several affordances of a Web environment that can enhance the usability of a Web-based application
29		Explain the connection between the design of a user interface and a model of user domain expertise
30		Match descriptions of cognitive models with the model names
31		
32	**(HCI) Developing Effective Interfaces**	Explain how the UI and usability affect one another
33		Define the different types of interaction styles
34		Select an appropriate UI interaction style for a task.
35		List examples of localization and globalization that would impact design.
36		Implement a simple UI.
37		
38	**(HCI) Emerging Technologies**	List several of the emerging alternative I/O devices
39		Describe the difference between mobile computing and wearable computing.
40		Describe and give examples of pervasive computing
41		
42	**(HCI) Human-Centered Computing**	Explain the characteristics of human-centered design
43		List the advantages and disadvantages for using a human- centered software development approach.
44		Identify a situation in which a user need can be addressed by a software product.
45		Describe, in scenario form, a problem situation to be addressed by a new or redesigned product.
46		
47	**(IAS) Fundamental Aspects**	Briefly describe the history of the field of Information Assurance and Security.

48		Explain the relationship between threats, vulnerabilities, countermeasures, attacks, compromises and remediation.
49		Give examples of how IT system components (e.g. servers, routers, people, software) can be countermeasures, vulnerabilities, and also threats.
50		Explain the security mindset and the role of "paranoia" in that mindset.
51		Explain and give examples of why information assurance and security must be "built in" to design and architecture from the beginning to be most effective.
52		Outline the system life-cycle and its relationship to security
53		Describe the Security Services as defined by the MSR model

54		Describe the Information States as defined by the MSR model.
55		Describe the Countermeasures as defined by the MSR model.
56		Given the MSR model, explain how the components interrelate to categorize threats, vulnerabilities and attacks.
57		Describe a disaster recovery scenario.
58		Define forensics
59		Describe a situation where a forensic investigation would be necessary.
60		
61	**(IAS) Operational Issues**	Describe legal and ethical considerations related to the handling and management of enterprise information assets
62		Specify what constitutes admissible evidence in a legal proceeding and how to acquire and maintain this information
63		Describe the importance of and key elements involved in incident tracking to develop an incident handling and reporting process
64		Identify risks associated with disasters or disruptions and specify key mitigation strategies.
65		Identify the types of company assets to be protected by a security plan
66		Specify the key aspects of physical site security

67		Describe the elements contributing to the cost of an organization's security management and operations process and their relation to risks and losses associated with information assurance or security related issues and incidents.
68		Describe and evaluate employment policies and practices that are relevant to safeguarding an organization's information assets.
69		Describe the importance of utilizing standards and key standard processes currently utilized in information assurance and their areas of relevance (i.e. DES – Data Encryption Standard).
70		Describe the purpose and elements of the key types of security audits. Discuss how various security standards (i.e. ISO 177799) impact the direction of these audits.
71		
72	**(IAS) Policy**	Describe the role of policy and procedure in the IAS Model.
73		Explain why policy and procedure are listed as
74		Explain how poorly defined and executed policies can be a vulnerability.

75		Explain how an organization might develop a policy to defend against password vulnerabilities.
76		Explain why a password policy might need to be modified due to changing circumstances
77		Explain why security policies must consider all aspects of an organization in order to be effective
		Give an example of how vulnerability in one area of an organization might enable a compromise in another area. (Example: weak physical security allows sniffer access to the LAN which allows a password to be read from a POP3 packet. The password is used to gain access to a corporate server. Login access to the server allows a root-kit to be applied and the bad guy has total access to the server).
79		Describe a situation in which an incident would require a full forensic approach including evidence gathering, full chain of custody auditing and expert analysis.
80		Explain how failure to follow good forensic procedures could make prosecution of an attacker impossible
81		
82	**(IAS) Security Domains**	Give examples of and explain shared concerns across a specified set of security domains.

83		Give examples of and explain concerns that are specific to specified security domains.
84		Discuss the impact of IAS on society and on one's professional and personal practice
85		
86	**(IAS) Threat Analysis Model**	Identify the aspects of a business that may be impacted by a security breach or interruption of operation.
87		Quantify the financial losses associated with potential security breaches and interruption of operations.
88		Identify and describe the nine steps to assess risks associated with security specified by the National Institute of Standards and Technology (NIST).
89		Describe the costs associated with actions that can be taken to mitigate security risks.
90		
91	**(IAS) Vulnerabilities**	Define white hat, black hat, hacker and cracker
92		Explain how culture, community, tools, and technologies contribute to compromising systems.
93		Describe the role of the user in information assurance and how they fit into an overall information assurance plan for an organization
94		Explain to a non-security community of users what measures they must follow and why, in a situation where their jobs are not security-related
95		Give an example of how inside and external attacks are similar and are different.

96		List and explain the typical threats and vulnerabilities for an organization's network
97		
98	**(IM) Information Management Concepts and Fundamentals**	Differentiate and use key terms such as: information, data, database, database management system, metadata, and data mining
99		Explain the role of data, information, and databases in organizations
100		Explain how data storage and retrieval has changed over time
101		Explain the advantages of a database approach compared to traditional file processing
102		Identify and explain the general types of databases: personal, workgroup, department, enterprise.
103		Explain how the growth of the Internet and demands for information for users outside the organization (customers and suppliers) impact data handling and processing.

104		Define data quality, accuracy and timeliness, and explain how their absence will impact organization
105		Describe mechanisms for data collection and their implications (automated data collection, input forms, sources).
106		Explain basic issues of data retention, including the need for retention, physical storage, security
107		Explain why data backup is important and how organizations use backup and recovery systems
108		
109	**(IM) Data Modeling**	Describe and interpret Entity Relationship diagrams
110		Create a simple Entity Relationship diagram
111		Describe and interpret Enhanced Entity Relationship diagrams.
112		Select appropriate business rules for a given scenario
113		Describe the relationship between a logical model and a physical model
114		Select a pattern or standard model that effectively corresponds to a given scenario
115		Explain the use of CASE tools in data modeling
116		Describe data integration
117		Describe meta-modeling
118		Describe a data warehouse, its basic structure, etc.
119		
120	**(IPT) Overview of Programming Languages**	Contrast the differences between the structured and object- oriented programming paradigms
121		Diagram and label models for both a compiled program and an interpretative program
122		Describe the benefits and weaknesses associated with using a virtual machine.

123		Give an example where an application language and a scripting language would be more appropriate and give a valid reason to support your selection
124		
125	**(IPT) Miscellaneous Issues**	List issues that should be considered when deciding whether to create new software or adapt existing software to solve a problem
126		Tell why it is important to version software and describe one mechanism that can be used to control the versioning of software
127		
128	**(NET) Foundations of Networking**	Locate and discuss current standards (i.e. RFC's, IEEE 802 etc.) and how standards bodies and the standardization process impact networking technology

129		Compare and contrast the OSI and Internet models as they apply to contemporary communication protocols
130		Describe and explain why different technologies are deployed in different contexts of networking, such as topology, bandwidth, distance, and number of users.
131		Explain the basic components and media of network systems and distinguish between LANs and WANs.
132		Explain how bandwidth and latency impact throughput in a data communications channel.
133		Deploy a basic Ethernet LAN and compare it to other network topologies.
134		Configure a client and a server operating system and connect the client machine to the server over a LAN
135		Analyze and compare the characteristics of various communication protocols and how they support application requirements
136		Demonstrate the ability to solve basic problems and perform basic troubleshooting operations on LANs and connected devices
137		
138	**(PF) Fundamental Programming Constructs**	Analyze and explain the behavior of simple programs involving the fundamental programming constructs covered by this unit
139		Modify and expand short programs that use standard conditional and iterative control structures and functions
140		Design, implement, test, and debug a program that uses each of the following fundamental programming constructs: basic computation, simple I/O, standard conditional and iterative structures, and the definition of functions
141		Choose appropriate conditional and iteration constructs for a given programming task.
142		Apply the techniques of structured (functional) decomposition to break a program into smaller pieces

143		Describe the mechanics of parameter passing and the issues associated with scoping
144		Describe the concept of recursion and give examples of its
145		
146	**(PF) Object-Oriented Programming**	Discuss and identify the concepts of encapsulation, abstraction, inheritance, and polymorphism
147		Design, implement, test, and debug simple programs in an object- oriented programming language

148		Describe how the class mechanism supports encapsulation and information hiding.
149		Design, implement, and test the implementation of "is-a" relationships among objects using a class hierarchy and inheritance.
150		Compare and contrast the notions of overloading and overriding methods in an object-oriented language
151		Describe the relationship between the static structure of the class and the dynamic structure of the instances of the class
152		Utilize iterators to access the elements of a container
153		Describe how constructors and destructors relate to the life of an object
154		Describe the relationship between an object and its corresponding class
155		
156	**(SA) Applications**	Install at least one current application.
157		Discuss the benefits of custom configuration of applications.
158		Describe the importance of application maintenance for an organization
159		Identify when an application meets the needs of an
160		Distinguish between server and client services
161		Identify situations in which a support organization needs to be consulted in resolving application issues
163		
164	**(SA) Administrative Activities**	Describe the need for managing IT resources.
165		Identify situations in which administrative activities are
166		Identify situations which interfere with administrative
167		Explain the need for policies governing IT systems
168		Explain why users need to be trained on IT systems and
169		
170	**(SIA) Requirements**	Identify the stakeholders of a system and formulate their needs

171		Compare and contrast the various requirements modeling techniques
172		Distinguish between non-functional and functional

173		Identify and classify the roles played by external users of a system.
174		Explain and give examples of use cases
175		Explain the structure of a detailed use case
176		Detail a use case based on relating functional requirements
177		Describe the types of event flows in a use case and under which conditions they occur.
178		Explain how requirements gathering fits into a system development lifecycle.
179		Explain how use cases drive testing throughout the system lifecycle.
180		
181	**(SIA) Acquisition and Sourcing**	Differentiate between build and buy in software and hardware acquisition
182		Explain the advantages and drawbacks of building and buying in general
183		Differentiate between in-sourcing and out-sourcing for the acquisition of IT services, including support
184		Explain the advantages and drawbacks of in-sourcing and out- sourcing in general.
185		Explain the importance of testing, evaluation and benchmarking in any IT sourcing decision.
186		Explain the primary components in an RFP
187		Explain the advantages and drawbacks of using RFPs in an IT sourcing decision
188		Explain the elements in a well-structured contract
189		Explain the importance of a well-structured contract in any IT sourcing decision
190		Given an RFP, recommend and justify one or more products that satisfy the criteria of the RFP
191		
192		
193		
194		
195		
196	**(SIA) Project Management**	Explain the key components of a project plan
197		Explain the importance of a cost/benefit analysis to the successful implementation of a project plan
198		Explain roles and responsibilities for key project personnel and stakeholders
199		Use appropriate project planning and tracking tools
200		Discuss the issues involved in creating a project schedule

201		Explain how to identify the lessons learned in a project closeout and review session
202		
203	**(SIA) Organization Context**	Discuss the relationship between business processes and system integration.
204		Discuss the need to take the current IT environment into account in defining a system architecture and in system integration.
205		Discuss the importance of organizational culture in any system integration project
206		
207	**(SIA) Architecture**	Explain "architecture" in the context of system integration and architecture. (IEEE Std. 1471)
208		Explain how complex systems can be represented using architectural views and how this facilitates system evolution over time.
209		Explain how some specific architectural views relate to the system lifecycle
210		Give examples of architectural frameworks and associated best practice models (SOA, Zachman Framework, ITIL, COBIT, ISO 20,000).
211		Give examples of modeling tools that support description and management of architectural views
212		
213	**(SP) Professional Communications**	Prepare and deliver an oral presentation for a user audience
214		Prepare and deliver an oral presentation for a management audience
215		Write a technical memo to management
216		Create user documentation for an IT system.
217		Create a set of technical requirements for an IT system.
218		Compare and contrast technical writing and expository
219		
220	**(SP) Teamwork Concepts and Issues**	Describe personality types and their effect on creating better teams.
221		Describe the basic elements of group dynamics.
222		Compare and contrast different conflict resolution strategies.
223		Compare and contrast basic leadership styles and their effect on teams.
224		Identify and use collaboration tools
225		Describe ways in which collaboration is used effectively in cross- functional teams

226		Prepare a self-evaluation of contributions made within a team experience.
227		Prepare a peer evaluation of contributions made by team members.
228		

229	**(SP) Social Context of Computing**	Interpret the social context of a particular information technology implementation.
230		Evaluate a particular implementation through the use of empirical data.
231		Describe positive and negative ways in which information technology alters the modes of interaction between people
232		Explain why computing and networking access is restricted in some countries
233		Explain the concept of "digital divide", identify some causes and
234		Identify underlying gender, cultural and diversity related issues in information technology.
235		Identify how information technology changes and affects culture as a whole
236		Identify how the internet has changed the face of computing and how it has affected society.
237		
238	**(SP) Intellectual Property**	Distinguish among copyrights, patents, trademarks and trade secrets
239		Discuss the ramifications of non-disclosure agreements
240		Discuss the implications of plagiarism, both in education and the profession
241		Discuss the consequences of software piracy on information technology and the role of relevant enforcement organizations
242		Discuss how intellectual property laws vary internationally
243		Describe consequences of the Digital Millennium Copyright
244		
245	**(SP) Legal Issues in Computing**	Identify methods by which computing services can be compromised.
246		Discuss the legal implications of compromising computing services.
247		Discuss the types of policies that should be included for system use and monitoring.

248		Describe the basic elements of compliance laws – such as ADA508, FERPA, HIPPA, and Sarbanes-Oxley
249		Describe the differences in accountability, responsibility, and liability
250		Describe current approaches to managing risk, and describe the legal implications of compromising computing services.
251		Evaluate an acceptable use policy
252		
253	**(SP) Organizational Context**	Outline the basic parts of a typical IT environment
254		Explain how IT must support business processes.

255		Identify how an IT professional maintains their professional behavior.
256		Explain how an organizational culture can affect IT
257		
258	**(SP) Professional and Ethical Issues & Responsibilities**	Identify the strengths and weaknesses of relevant professional codes as expressions of professionalism and guides to decision- making
259		Identify ethical issues that arise in the information technology field and determine how to address them technically and ethically
260		Apply appropriate professional codes of conduct in
261		Identify progressive stages in a whistle-blowing incident.
262		List the underlying philosophical aspects of ethical decision making
263		Identify how information technology is affected by workplace issues such as harassment and discrimination.
264		Identify how society has been affected by identify theft and what to do to protect individuals
265		Compare and contrast two published codes of ethics
266		
267	**(SP) History of Computing**	Identify and describe emerging technologies in the context of the history of computing technologies
268		Identify significant trends in the information technology profession.
269		Identify how life-long learning impacts the information technology professional.

(Lunt et al., 2008, p. 68-139)

Appendix F IIBA® Learning Objectives and Competencies

	A	B	C
1	**Knowledge Area**	**Competency**	**Observable Behaviors**
2	**Business Analysis Planning and Monitoring**	Selects appropriate business analysis approach	Displays and maintains a high level of awareness as related to current Industry and organizational trends, standards and disciplines being used to deliver new or enhanced business analysis approaches to solutions
3			Utilizes expertise in plan-driven and change-driven approaches to lead teams to select approaches that best fit initiative needs
4			Ability to determine when and how to modify a selected approach as necessary in order apply an appropriate level of rigor and best meet the needs of the area of analysis
5			Effectively communicates approach to stakeholders
6			Effectively gains needed stakeholder and team buy-in to the approach selected
7			
8		Evaluates project complexity, assumptions,	Evaluates based on the big-picture view of the project outside of just the IT domain, vendor domain or just the business unit domain
9			Proactively gathers information from project team members
10			Resets to the big picture when needed
11			
12		Identifies all stakeholders	Displays and maintains a high level of awareness as related to current enterprise architecture and organizational process to ensure all areas impacted have adequate/appropriate stakeholder representation
13			Ability to select and perform a variety of methods to ensure comprehensive representation for all areas potentially impacted in the effort
14			
15		Determines stakeholder influence and	Accurately assesses and identifies the level of stakeholder involvement (how they are involved), level of support for the effort, as well as the best approach on how to and when to strategically engage
16			Ability to assess and identify levels of influence, agendas and authority levels, as well as identify key relationships and dynamics of stakeholder interactions
17			Ability to adjust behavior, communications style and interactions with stakeholders based on stakeholder needs
18			

19		Builds and manages stakeholder (internal and external) relationships. Relationships with stakeholders include: Business partners, users, vendors, customers, project team members and management leaders	Effectively builds credibility and trust with stakeholders
20			Successfully communicates and manages stakeholder expectations
21			Ability to keep stakeholders engaged, responsive and proactive in working toward deliverable goals and objectives
22			
23		Develops a business analysis work-plan to manage own and teams activities, tasks, deliverables and	Effectively/accurately defines and communicates the activities the team will perform to develop the business analysis activities (work plan) for the effort
24			Accurately identifies requirements scope and deliverables
25			Provides an accurate estimation of resources necessary to perform requirements tasks (projected schedule and cost estimates/budget impacts)
26			Accurately identifies requirement risks and mitigations
27			Ability to effectively use a variety of estimating techniques to drive precision and accuracy in estimation
28			Ability to accurately identify comprehensive deliverables and associated tasks required by the effort early in the process
29			Effectively prioritizes BA work to meet stakeholder needs
30			Accurately estimates effort required for BA tasks
31			

32		Develops effective communication plan to meet project and stakeholder needs	Develops plan considering geography, culture, formality of organization and frequency needs of stakeholders
33			Displays and maintains complete understanding of how and when the
34			Defines, monitors and enforces team responsibilities as related to collecting, distributing, accessing and updating requirements information
35			
36		Plans requirements approval and change	Develops and communicates plan to manage approval of requirements and changes to solution or requirements scope
37			Effectively manages and executes plan of approval and change to requirements
38			Displays and maintains appropriate level of traceability in plan

39			Plans effective prioritization techniques to prioritize requirements for the solution
40			
41		Identifies and communicates risks and issues that may require changes to plans or scope	Accurately assess/identify project and/or business risks and plan risk
42			Ability to provide critical decision support by identifying acceptable risks and outlining risk impact/responses
43			Effectively communicates risk impact of changes and provides options to manage/mitigate
44			
45		Measures and tracks quality of business analysis work	Selects and performs appropriate techniques to measure business analysis work.
46			Establishes metrics and measurements to track, assess and report on the quality of work
47			Sets expectation regarding what constitutes effective business analysis work for initiative
48			
49		Reports on business analysis measurements	Effectively communicates and documents measurement results of business analysis work efforts
50			
51		Improves business analysis performance by	Identifies opportunities for improvement of business analysis practices and processes, and identifies preventative or corrective actions for incorporation as improvements into the business analysis plan
52			
53		Complies with and upholds organizational standards	Consistently follows and applies organizations methodologies, BA practices, SDLC and compliance requirements
54			
55		Responds to changing organizational priorities	Adapts approach to changing strategies, funding decisions, risks and organizational direction
56			Adapts approach as required to adjust to changing conditions and meet new challenges
57			
58	**Elicitation**	Ensures appropriate stakeholders are involved in elicitation activities	Accurately assesses the stakeholders needed to participate in elicitation activities
59			Ability to adjust plan and approach for elicitation activities in light of project and stakeholder schedule needs.
60			Finds alternative and creative ways to get those involved that are not co-located or unavailable at needed times
61			
62		Obtains needed information from stakeholders to form requirements	Effectively uses a variety of elicitation techniques appropriate to the situation and stakeholder

63			Ability to use a variety of techniques to accurately elicit out requirements when stakeholders are focused on solutions, or are biased, or do not know or understand the scope of the analysis area
64			Accurately assesses when to continue eliciting to uncover further information
65			Demonstrates the ability uncover additional information from stakeholders when the needed information is not known as important to the stakeholder, but critical to requirements quality
66			Effectively describes to stakeholders the purpose and value of additional elicitation of requirements
67			Forms and asks probing questions
68			
69		Captures information provided in elicitation sessions	Accurately captures information in a manner that the stakeholders understand and can review and validate
70			Accurately translates stakeholder information into solution requirements
71			Applies active listening to ensure accurate information is captured
72			Ability to ensure that elicitation results link to the business goal/owner and can be measured or decomposed to measurable requirements
73			
74		Validates requirements with stakeholder	Accurately validates that the documented requirements match the intention of the stakeholders needs
75			
76	**Requirements Management and Communication**	Obtains the needed approvals on solution requirements	Accurately baselines requirements
77			Consistently obtains timely stakeholder sign-off of requirements
78			
79		Manages changes to requirements	Consistently identifies requirements change and acts to manage change
80			Regularly manages stakeholder expectations
81			Effectively gauges and acts on the need to educate stakeholders on change management
82			Accurately assesses impact of change to business case; communicates impact and facilitates stakeholder consensus
83			
84		Manages conflicts and issues to resolution	Effectively maintains consensus among stakeholders on solution scope
85			Accurately recognizes when an issue is a requirements issue versus project issue and escalates appropriately

86			Collaborates effectively with PM on issues and conflicts that impact time, cost, scope, quality and risk
87			Correctly tracks, communicates and proactively follows up on issues. Actively ensures the right people are aware of issues and thoroughly documents resolution
88			Actively monitors resolution progress and success
89			Effectively uses a variety of techniques to manage conflict
90			Successfully negotiates conflicts to a win/win
91			Maintains collaborative style with team members and stakeholders
92			Maintains composure and self-control around conflict
93			Consistently receives feedback from stakeholders that satisfactory resolution was reached
94			
95		Traces requirements from business case to implemented solution	Develops and maintains the correct level of traceability appropriate for the work effort
96			Correctly traces solution requirements backwards and forwards
97			Systematically ensures requirements are organized to enable quality traceability
98			
99		Leverages the uses of traceability	Consistently uses traceability to enable quality impact analysis
100			Consistently uses traceability to manage requirements risk
101			Consistently uses traceability to manage requirements change
102			Consistently uses traceability requirement dependency to assist with requirement prioritization
103			Consistently uses traceability to collaborate with project teams (quality assurance, business testing teams, project management,
104			Ability to assess how much requirements traceability is required to manage risk
105			
106		Identifies and maintains requirements for reuse	Accurately assesses which requirements will add value to the organization by leveraging reuse
107			Consistently develops and applies reuse standards of requirements maintenance
108			Demonstrates understanding of benefits of maintaining requirements
109			
110		Prepares requirements documentation	Creates comprehensive work products documenting solution requirements
111			Accurately assesses the needs of the audience to develop work products at the appropriate level of detail to communicate to audience

112			Effectively uses the requirements package as a basis for solution design and implementation
113			Ability to accurately assess and determine when a requirements set is at the appropriate level of rigor sufficient to support development or make a solution decision
114			
115		Presents requirements in understandable format	Applies experience and knowledge of a variety of presentation techniques for requirements
116			Effectively formats and presents requirements in a manner appropriate to stakeholder
117			Successfully uses requirements package iteratively to communicate a potentially different package to different audiences
118			
119		Confirms that stakeholders have a shared understanding	Effectively reviews requirements with all stakeholders informally and formally
120			Consistently works to facilitate a common understanding of requirements through various communication techniques
121			Effectively uses alternative visual and contextual methods to communicate
122			
123		Uses appropriate communication method based on stakeholder	Effectively communicates to stakeholders by using the appropriate level of detail for the audience
124			Communicates effectively to executive level stakeholders
125			Communicates effectively to users and technical stakeholders
126			Communicates effectively to external vendors and stakeholders
127			
128		Assesses impacts of changes to requirements	Accurately identifies additional stakeholders that need to be included and understand impact
129			Effectively analyzes cost/benefit and risk of change
130			Consistently analyzes if the change impacts the business case versus just the project plan
131			Consistently analyzes if the change improves business case or negates it
132			Consistently analyzes if the change has cross impacts to other initiatives
133			
134	**Enterprise Analysis**	Identifies and defines business needs	Accurately identifies why a change to a system, process or capability is needed
135			Ensures the business need aligns to business goals and objectives
136			Differentiates and understands both strategic and tactical business needs

137			Effectively uses decomposition of goals to define achievable objectives and measures in work effort
138			Accurately articulates the essence of stakeholder vision while appropriately questioning the assumptions and constraints buried in stakeholder statements of requirements
139			
140		Identifies opportunities for improvement	Effectively recognizes opportunities beyond the underlying business needs and issues
141			Successfully helps stakeholders see areas of opportunity and facilitates exploration
142			

143		Understands overall business structure, strategy and	Demonstrates a broad knowledge of general business functions:
144			Understands general relationships between various business units
145			Understands how business units serve the organization as whole
146			Understands how the organization operates within the domain/industry and demonstrates the understanding of domain components
147			Understands an organization's strategic intents
148			Understands KPIs of an organization
149			Understands business change drivers
150			
151		Understands organizational culture, structure and impact on work efforts	Effectively uses organizational networks/relationships to influence work outcomes and decisions
152			Effectively uses organizational authority structures to facilitate decision making and escalation of issues
153			Effectively utilizes communication structures within the organization to influence work outcomes
154			Appropriately adjusts own behaviors to culture of business work group
155			Understands the framework (structure, people, processes and technology) that supports the organization's strategy
156			Accurately identifies current enterprise business capabilities
157			Accurately identifies gaps that prevent the organization from achieving desired outcomes
158			Accurately identifies shortcomings, problems and limitations of existing solution
159			
160		Identifies and proposes possible solution approach	Effectively facilitates idea generation

161			Effectively works with stakeholders to identify alternative solutions
162			Accurately identifies assumptions and constraints
163			
164		Describes and selects a solution approach from a	Accurately assess the organizations readiness for proposed approach
165			Effectively communicates possible solution approaches to stakeholders
166			Consistently captures information about each option to facilitate effective review of options
167			Provides a structure and process to ranking and weighing options for effective decision making by stakeholders
168			
169		Defines the new capabilities that the project, iteration	Accurately conceptualizes the recommended solution; enables stakeholders to understand the new capabilities
170			Accurately defines in-scope and out-of-scope in terms of the solution boundaries to meet the business case
171			Accurately defines implementation approach of selected solution by defining how the project will deliver the solution scope.
172			Accurately defines dependencies, constraints and assumptions (technical and business) of the solution scope
173			
174		Determines justification of investment for proposed solution	Works with stakeholders to define benefits and linkage to the measures of success of proposed solution
175			Works with stakeholders in ensuring the needed level of research is completed to accurately define the solution benefits and risks
176			Accurately represents the benefits of the proposed solution
177			Effectively communicates how the proposed solution will achieve business objectives.
178			Accurately assesses costs and risks of the proposed solution
179			

180		Prepares a decision package	Effectively presents the information needed to facilitate a decision to invest and move forward with the proposed solution
181			
182	**Requirements Analysis**	Prioritizes requirements effectively based on factors including business value, cost to deliver and	Effectively works among stakeholders to build consensus on requirements prioritization to ensure the analysis and implementation is focused on the most critical requirements

183			Accurately reflects the requirements priority according to stakeholder input on business value and risk
184			Accurately reflects the requirements priority according to stakeholder input on impact of requirements on solution as a whole
185			Understands and communicates the value of requirements prioritization to the various project and solution stakeholders
186			Creates prioritization attributes appropriate to work effort
187			Applies business principles and performance measures to facilitate requirements prioritization
188			Maintains neutrality among team and organizational politics when prioritizing; focused on business value and business case
189			
190		Organizes and synthesizes large amounts of information	Effectively organizes requirements in views that are understandable from all stakeholder perspectives.
191			Clearly articulates the relationships between the various requirements, stakeholder needs and models
192			Identifies and recommends the use of repeatable patterns where appropriate
193			Demonstrates understanding of which requirements models and formats are appropriate for the business domain, solution scope and stakeholder audience
194			Clearly aligns levels of abstraction in requirements to stakeholder needs
195			
196		Understands appropriate use of various	Clearly expresses stakeholder desires and/or current organizational state using a combination of textual formats, models, diagrams and matrices
197			Consistently leverages models and specifications to provide insight into opportunities for improvement
198			Effectively uses matrices to organize requirements and represent relationships between requirements.
199			
200		Develops abstract models that describe a business domain	Appropriately uses models to represent a simplified view of a complex reality
201			Ensures that information captured in different models is consistent and accurate
202			Effectively uses models as a tool to document requirements and also a tool to aide in elicitation activities
203			Effectively uses formal and informal modeling as appropriate to the audience Ensures that information captured in different models is consistent and accurate
204			

205		Identifies and communicates factors other than requirements that affect which solutions are	Accurately identifies assumptions and constraints
206			Confirms accuracy of assumptions and constraints
207			Consistently considers various types of assumptions and constraints: technical and business
208			
209		Ensures that requirements and models meet the needed quality to effectively guide further	Consistently ensures that requirements are ready for review by stakeholders
210			Accurately assess the quality of requirements and characteristics of requirements that signify quality (cohesive, complete, consistent, correct, feasible, modifiable, unambiguous and testable)
211			Iteratively checks work in progress for quality attributes
212			Iteratively compares varying requirements deliverables to one another checking for consistency
213			Appropriately uses text to describe one and only one requirement at a time
214			
215		Ensures that all requirements support the delivery of business value, fulfills goals and objectives,	Effectively manages conflicting needs and expectations exposed in the requirements validation process
216			Accurately assesses that all requirements can demonstrate delivery of value
217			
218	**Solution Assessment**	Assesses solution proposals and demonstrate which	Accurately determines if the solution delivers enough value to justify implementation
219			Effectively communicates recommendation of solution justification to move forward
220			Demonstrates understanding of advantages and disadvantages of alternative solutions
221			When multiple solutions are available, effectively evaluates which option will deliver the greatest business value
222			
223		Allocates stakeholder and solution requirements among solution components to maximize business	Assesses tradeoffs between options to maximize benefits and minimize cost

224			Demonstrates usage of various allocation categories (release, solution component, business unit, etc . . .) and uses the most appropriate given the point in time in the project
225			Consistently uses allocation throughout the project lifecycle to maximize business value
226			
227		Assesses the organizational readiness for the new solution	Effectively communicates solution impact to stakeholders
228			Demonstrates understanding of the changes that will occur with the new solution (business area, technical infrastructure, processes and operations)
229			Accurately assesses stakeholder beliefs, attitudes and willingness to adapt to new solution
230			Demonstrates understanding of the forces that support and oppose the change and works to strengthen support
231			
232		Defines capabilities and requirements to support	Facilitates requirements for transition of data
233			Facilitates requirements for the transition of “work in progress”
234			Facilitates requirements for needed training
235			Facilitates discussions on operational change needs due to new solution being in place
236			
237		Validates that the solution meets the business need	Develops acceptance criteria and a plan to evaluate
238			Facilitates acceptance of the solution
239			Accurately ensures that the solution performs to meet the business requirements
240			
241		Determines the most appropriate response to identified defects	Assess the effect and impact a defect or issue has on the business value of the solution
242			Effectively prioritizes defects and issues with the solution
243			Effectively evaluates defects and issues for potential workarounds that are acceptable until defect can be addressed
244			
245		Measures and evaluates solutions for value and opportunities	Proactively investigates how a solution is actually used after it is deployed
246			Proactively seeks to identify how the users have adapted and/or modified the solution and why
247			Validates the previously defined performance metrics for the solution

248			Effectively communicates to stakeholders how the solution is performing in relationship to the business goals and objectives.
249			
250	**Analytical Thinking and Problem Solving**	Creative Thinking	The successful generation and productive consideration of new ideas
251			Application of new ideas to resolve existing problem
252			Willingness of stakeholders to accept new approaches
253			
254		Decision Making	Confidence of the participants in the decision-analysis process that a decision is correct
255			New information or alternatives that cause a decision to be revisited are genuinely new and not simply overlooked
256			Decisions are effective in addressing the underlying problem
257			The impact of uncertainty and new information when making decisions can be effectively assessed
258			
259		Learning	Agreement by stakeholders that analysis models effectively and completely describe the domain
260			Identification of related problems or issues from multiple areas in the domain
261			Rapid absorption of new information or new domains
262			
263		Problem Solving	Confidence of the participants in the problem-solving process that a selected solution is correct
264			New solution options can be evaluated effectively using the problem solving framework
265			Selected solutions meet the defined objectives and solve the underlying problem
266			The problem-solving process avoids making decisions based on preconceived notions, organizational politics or other traps that may cause a sub-optimal solution to be selected
267			
268		Systems Thinking	Understanding of how a change to a component affects the system as a whole
269			Identification of reinforcing and compensating feedback loops
270			Understanding of how systems adapt to external pressures and changes
271			
272	**Behavioral Characteristics**	Ethics	Decisions are made with due consideration to the interests of all stakeholders
273			Reasons for a decision are clearly articulated and understood
274			Prompt and full disclosure of potential conflicts of interest
275			Honesty regarding one's abilities, the performance of one's work and accepting responsibility for failures or errors
276			

277		Personal Organization	The ability of the business analyst to find information
278			Regular on-time completion of task
279			Efficiency in the completion of work
280			The ability to easily identify all outstanding work and the status of each work item
281			
282		Trustworthiness	Stakeholders involving the business analyst in decision-making
283			Stakeholder acceptance of the business analyst's recommendations
284			Willingness of stakeholders to discuss difficult or controversial topics with the business analyst
285			Willingness of stakeholders to support or defend the business analyst when problems occur

286			
287	**Business Knowledge**	Business Principles and Practices	practices relating to: - Common business management and decision making concepts, principles activities and practices
288			Understanding of relevant regulatory, compliance and governance frameworks
289			Understanding of auditing and security issues
290			
291		Industry Knowledge	Understanding of industry related material and keeps abreast of what is taking place in the industry
292			The ability to identify key trends shaping the industry
293			Knowledge of major competitors and partners for the organization
294			Knowledge of major customer segments
295			Knowledge of common products and product types
296			Knowledge of sources of information about the industry, including relevant trade organizations or journals
297			Understanding of industry-specific resource and process documents
298			Understanding of industry standard processes and methodologies
299			Understanding of the industry regulatory environment
300			
301		Organization Knowledge	Understanding of terminology or jargon used in the organization
302			Understanding of the products or services offered by the organization
303			Ability to identify subject matter experts in the organization

304			Organizational relationships and politics
305			
306		Solution Knowledge	Reduced time or cost to implement a required change
307			Shortened time on requirements analysis and/or solution design
308			Understanding when a larger change is justified based on business benefit
309			Understanding how additional capabilities present, but not currently used, in a solution can be deployed to provide business value
310			
311	**Communication Skills**	Oral Communication	Effectively paraphrasing statements to ensure understanding
312			Effectively facilitating sessions, ensuring success through preparedness and co-ordination
313			Developing and delivering powerful presentations by positioning content and objectives appropriately (i.e. positive versus negative tone)
314			Can communicate the criticality or urgency of a situation in a calm, rational manner with proposed solutions
315			
316		Teaching	Verifying that learners have acquired information that has been imparted to them
317			Ability of learners to use new skills or demonstrate new knowledge
318			
319		Written Communications	Ability to adjust the style of writing for the needs of the audience
320			Proper use of grammar and style
321			Appropriate choice of words
322			Ability of the reader to paraphrase and describe the content of the written communication
323			
324	**Interaction Skills**	Facilitation and Negotiation	another's positions
325			Use of meeting management skills and tools (including agendas and the use of meeting minutes to keep discussions focused and organized

326			Preventing discussions from being sidetracked onto irrelevant topics
327			Identifying common areas of agreement
328			Effective use of different negotiation styles
329			Ability to identify important issues
330			Understanding and considering all parties' interests, motivations and objectives

331			Encouraging stakeholders to reach win/win outcomes on a regular basis
332			Understanding of political implications in conflicts and negotiates in a politically sensitive manner
333			Understanding the impact of time and timing on negotiations
334			
335		Leadership and Influencing	Reduced resistance to necessary changes
336			Team members and stakeholders demonstrating a willingness to set aside personal objectives when necessary
337			Articulation of a clear and inspiring vision of a desired future state
338			
339		Teamwork	Fostering a collaborative working environment
340			Effective resolution of conflict
341			Developing trust among team members
342			Support among the team for shared high standards of achievement
343			Team members have a shared sense of ownership of the team goals
344			
345	**Software Applications**	General Purpose Applications	Ability to apply an understanding of one tool to other similar tools
346			Able to identify major tools in the marketplace and describe how they are used in any given situation
347			Understands and is able to use most of the major features of the tool
348			Able to use the tools to complete requirements-related activities more rapidly than is possible without them
349			Able to track changes to the requirements made through the tools
350			
351		Specialized Applications	Ability to apply an understanding of one tool to other similar tools
352			Able to identify major tools in the marketplace and describe how they are used in any given situation
353			Understands and is able to use most of the major features of the tool
354			Able to use the tools to complete requirements-related activities more rapidly than is possible without them
355			Able to track changes to the requirements made through the tools

(International Institute of Business Analysis, 2011, p. 31-41)

Appendix G IS Model Curriculum Learning Objective Mapping to IIBA® Knowledge Areas and Competency Groups

	A	B	C
1	**IIBA Knowledge Area**	**IS M.C. Learning Objective**	**IS Sheet Col/Row**
2	**Business Analysis and Planning**	Mitigate risks as well as plan for and recover from disasters	B8
3		Evaluate the total cost of ownership and return on investment for architecture alternatives	B40
4		Utilize techniques for assessing and managing risk across the portfolio of the enterprise	B41
5		Initiate, specify, and prioritize information systems projects and to determine various aspects of feasibility of these projects	B52
6		Manage project teams, including the fundamentals of leadership and team motivation.	B55
7		Manage project communication, both internal to the team, and external to other project stakeholders	B56
8		Initiate projects, including project selection and defining project scope	B57
9		Manage project schedules with appropriate techniques and tools.	B58
10		Manage project resources, including human resources, capital equipment, and time	B59
11		Manage project quality, including the identification of the threats to project quality, techniques for measuring project quality, and the techniques for ensuring project quality is achieved	B60
12		Manage project risk, including the identification of project risk, and the techniques for ensuring project risk is controlled	B61
13		Manage project execution, including monitoring project progress and managing project change, and appropriately documenting and communicating project status	B63
14		Appreciate ethnic cultural differences in working with global teams either internal to organizations or by engaging offshore outsourcers	B67
15		Understand the types of business needs that can be addressed using information technology-based solutions	B69
16		Manage information systems projects using formal project management methods.	B75
17		Apply information requirements specification processes in the broader systems analysis & design context	B21

18		Evaluate and plan for the integration of emerging technologies	B42
19		Understand the phases of the project management lifecycle.	B54
20			
21	**Elicitation**	Communicate effectively with various organizational stakeholders to collect information using a variety of techniques and to convey proposed solution characteristics to them.	B74
22			
23	**Requirements Management and**	Control projects through information tracking and cost and change control techniques	B64
24		Within the context of the methodologies they learn, write clear and concise business requirements documents and convert them into technical specifications	B73
25		Communicate effectively with various organizational stakeholders to collect information using a variety of techniques and to convey proposed solution characteristics to them.	B74
26			
27	**Enterprise Analysis**	Understand how various types of information systems provide the information needed to gain business intelligence to support the decision making for the different levels and functions of the organization.	B11
28		Understand how enterprise systems foster stronger relationships with customers and suppliers and how these systems are widely used to enforce organizational structures and processes	B12
29		Understand the value of information systems investments as well as learn to formulate a business case for a new information system, including	B6
30		Understand how organizations develop and acquire information systems and technologies	B13
31		Understand how and why information systems are used today.	B2
32		Explain the technology, people, and organizational components of information systems.	B3
33		Understand globalization and the role information systems has played in this evolution	B4

34		Understand how businesses are using information systems for competitive advantage vs. competitive necessity	B5
35		Understand a variety of frameworks for enterprise architecture analysis and decision making.	B39
36		Understand the core concepts of data/information architecture and evaluate existing data/information architecture designs	B46
37		Understand the integration of enterprise systems with interorganizational partners such as suppliers, government, etc.	B50
38		Clearly define problems, opportunities, or mandates that initiate projects.	B71
39		Understand the various functions and activities within the information systems area, including the role of IT management and the CIO, structuring of IS management within an organization, and managing IS professionals within the firm	B83
40		View an organization through the lens of non-IT senior management in deciding how information systems enable core and supportive business processes as well as those that interface with suppliers and customers	B84
41		Understand the concepts of information economics at the enterprise level.	B85
42		Appreciate how IS represents a key source of competitive advantage for firms.	B86
43		Structure IS-related activities to maximize the business value of IS within and outside the company.	B87
44		Understand existing and emerging information technologies, the functions of IS and its impact on the organizational operations	B88
45		Evaluate the issues and challenges associated with successfully and unsuccessfully incorporating IS into a firm.	B89
46		Understand how strategic decisions are made concerning acquiring IS resources and capabilities including the ability to evaluate the different sourcing options.	B90
47		Apply information to the needs of different industries and areas	B91
48		Understand the role of IT control and service management frameworks from the perspective of managing the IS function in an organization	B92
49		Understand the fundamentals of enterprise systems and issues associated with their implementation	B114

50		Evaluate the costs and benefits of implementing an enterprise system	B115
51		Understand how enterprise systems integrate functional areas into one enterprise wide information system.	B116
52		Explain how “best practices” are incorporated in enterprise systems	B117
53		Recognize how an organizational process often spans different functional areas	B118
54		Describe the role of enterprise systems in carrying out processes in an organization	B119
55		Learn to integrate key concepts from functional-oriented courses, such as accounting, marketing, and organizational behavior, to promote the development of integrative skills	B120
56		Explain how integrated information sharing increases organizational efficiencies	B121
57		Identify, describe, and evaluate the major enterprise system software providers and their packaged systems.	B122
58		Understand current trends related to enterprise systems	B123
59			
60	**Requirements Analysis**	Initiate, specify, and prioritize information systems projects and to determine various aspects of feasibility of these projects	B70
61		Use contemporary CASE tools for the use in process and data modeling	B77
62		Model business processes	B102
63		Understand different approaches to business process modeling and improvement	B109
64		Use basic business process modeling tools	B111
65		Use at least one conceptual data modeling technique (such as entity-relationship modeling) to capture the information requirements for an enterprise domain.	B22
66		Link to each other the results of data/information modeling and process modeling.	B23
67		Manage proliferating types and volume of content	B44
68			
69	**Solution Assessment**	Understand the foundations of project management, including its definition, scope, and the need for project management in the modern organization	B53

70		Articulate various systems acquisition alternatives, including the use of packaged systems (such as ERP, CRM, SCM, etc.) and outsourced design and development resources.	B76
71		Compare the acquisition alternatives systematically	B78
72		Benchmark business processes performance	B103
73		Assess business processes performance	B104
74		Design business process improvements	B105
75		Understand the role and potential of IT to support business process management	B106
76		Understand the challenges of business process change	B107
77		Understand how to support business process change	B108
78		Understand the challenges and risks concerning business process outsourcing, especially those dealing with ethnic cultural differences from offshore engagements	B110
79		Simulate simple business processes and use simulation results in business process analysis	B112
80			
81	**Analytical Thinking and Problem**	Understand how information systems are enabling new forms of commerce between individuals, organizations, and governments	B9
82		Be aware of emerging technologies that enable new forms of communication, collaboration, and partnering	B10

(Topi et al., 2010, p. 35-70)

Appendix H IT Model Curriculum Learning Objective Mapping to IIBA® Knowledge Areas and Competency Groups

	A	B	C
1	**IIBA Knowledge Area**	**IT M.C. Learning Objective**	**IT M.C. Sheet Col/Row**
2	**Business Analysis Planning and Monitoring**	Outline the system life-cycle and its relationship to security	B52
3		Identify risks associated with disasters or disruptions and specify key mitigation strategies.	B64
4		Identify the aspects of a business that may be impacted by a security breach or interruption of operation.	B86
5		Quantify the financial losses associated with potential security breaches and interruption of operations.	B87
6		Describe the costs associated with actions that can be taken to mitigate security risks.	B89
7		Describe the need for managing IT resources.	B164
8		Identify situations in which administrative activities are required	B165
9		Identify situations which interfere with administrative activities	B166
10		Identify the stakeholders of a system and formulate their needs	B170
11		Compare and contrast the various requirements modeling techniques	B171
12		Identify and classify the roles played by external users of a system.	B173
13		Explain roles and responsibilities for key project personnel and stakeholders	B198
14		Use appropriate project planning and tracking tools	B199
15			
16	**Elicitation**	Distinguish between non-functional and functional requirements	B172
17		Explain how requirements gathering fits into a system development lifecycle.	B178
18			

19	**Requirements Management and Communication**	Describe the basic elements of group dynamics.	B221
20		Compare and contrast different conflict resolution strategies.	B222
21		Write a technical memo to management	B215
22		Create a set of technical requirements for an IT system.	B217
23		Compare and contrast technical writing and expository writing.	B218
24			
25	**Solution Assessment**	Differentiate between build and buy in software and hardware acquisition	B181
26		Explain the advantages and drawbacks of building and buying in general	B182
27		Differentiate between in-sourcing and out-sourcing for the acquisition of IT services, including support	B183
28		Explain the advantages and drawbacks of in-sourcing and out-sourcing in general.	B184
29		Explain the importance of testing, evaluation and benchmarking in any IT sourcing decision.	B185
30		Explain the primary components in an RFP	B186
31		Explain the advantages and drawbacks of using RFPs in an IT sourcing decision	B187
32		Explain the elements in a well-structured contract	B188
33		Explain the importance of a well-structured contract in any IT sourcing decision	B189
34		Given an RFP, recommend and justify one or more products that satisfy the criteria of the RFP	B190
35		Explain the advantages and drawbacks of using RFPs in an IT sourcing decision	B191
36		Explain the elements in a well-structured contract.	B192

37		Explain the importance of a well-structured contract in any IT sourcing decision	B193
38		Given an RFP, recommend and justify one or more products that satisfy the criteria of the RFP.	B194
39		Explain the importance of a cost/benefit analysis to the successful implementation of a project plan	B197
40		List issues that should be considered when deciding whether to create new software or adapt existing software to solve a problem	B125
41		Identify situations in which a support organization needs to be consulted in resolving application issues	B161
42		Prepare and deliver an oral presentation for a user audience	B213
43		Prepare and deliver an oral presentation for a management audience	B214
44			
45	**Enterprise Analysis**	Discuss the relationship between business processes and system integration.	B203
46		Discuss the need to take the current IT environment into account in defining a system architecture and in system integration.	B204
47		Discuss the importance of organizational culture in any system integration project	B205
48		Explain “architecture” in the context of system integration and architecture. (IEEE Std. 1471)	B207
49		Explain how complex systems can be represented using architectural views and how this facilitates system evolution over time.	B208
50		Explain how some specific architectural views relate to the system lifecycle	B209
51		Give examples of architectural frameworks and associated best practice models	B210
52		Give examples of modeling tools that support description and management of architectural views	B211
53		Explain how the components of an IT system interrelate.	B2
54		Explain how and why complexity occurs in IT.	B3
55		Explain how organizational context is influenced by and impacts the development and deployment of IT systems.	B11

56		Illustrate the use of information and communication technologies to solve problems as an IT professional.	B9
57		Explain why data backup is important and how organizations use backup and recovery systems	B107
58			
59	**Requirements Analysis**	Create a simple Entity Relationship diagram	B110
60		Describe and interpret Enhanced Entity Relationship diagrams.	B111
61		Describe the relationship between a logical model and a physical model	B113
62		Explain the use of CASE tools in data modeling	B115
63		Select appropriate business rules for a given scenario	B112
64		Explain and give examples of use cases	B174
65		Explain the structure of a detailed use case	B175
66		Detail a use case based on relating functional requirements	B176
67		Describe the types of event flows in a use case and under which conditions they occur.	B177
68		Explain how use cases drive testing throughout the system lifecycle.	B179
69			
70	**Analytical Thinking and Problem Solving**	Interpret the social context of a particular information technology implementation.	B229
71		Evaluate a particular implementation through the use of empirical data.	B230
72		Describe positive and negative ways in which information technology alters the modes of interaction between people	B231
73		Analyze and explain the behavior of simple programs involving the fundamental programming constructs covered by this unit.	B138
74		Modify and expand short programs that use standard conditional and iterative control structures and functions	B139
75		Design, implement, test, and debug a program that uses each of the following fundamental programming constructs: basic computation, simple I/O, standard conditional and iterative structures, and the definition of functions	B140
76		Choose appropriate conditional and iteration constructs for a given programming task.	B141
77		Apply the techniques of structured (functional) decomposition to break a program into smaller pieces	B142
78		Describe the mechanics of parameter passing and the issues associated with scoping	B143
79		Describe the concept of recursion and give examples of its use.	B144
80			
81	**Behavioral Characteristics**	Identify the strengths and weaknesses of relevant professional codes as expressions of professionalism and guides to decision-making	B258
82		Identify ethical issues that arise in the information technology field and determine how to address them technically and ethically	B259
83		Apply appropriate professional codes of conduct in assignments.	B260
84		Identify progressive stages in a whistle-blowing incident.	B261
85		List the underlying philosophical aspects of ethical decision making	B262

86		Identify how information technology is affected by workplace issues such as harassment and discrimination.	B263
87		Identify how society has been affected by identify theft and what to do to protect individuals	B264
88		Compare and contrast two published codes of ethics	B265
89			
90	**Business Knowledge**	Explain the relationship between IT and related and informing disciplines.	B16
91		Explain how and to what extent IT has changed various application domains.	B18
92		Explain how IT has impacted the globalization of world economy, culture, political systems, health, security, warfare, etc.	B19

(Lunt et al., 2008, p. 68-139)

Appendix I Gap Analysis (Master List)

	A	B	C	D	E	F
1	**IIBA Knowledge Area/Competency**	**Learning Objective**	**IIBA Sheet**	**IS M.C. Sheet**	**IT M.C. Sheet**	**CIT LO Map**
2	**Business Analysis and Planning**	Displays and maintains a high level of awareness as related to current industry and organizational trends, standards and disciplines being used to deliver new or enhanced business analysis approaches to solutions	C2			D154
3		Utilizes expertise in plan-driven and change-driven approaches to lead teams to select approaches that best fit initiative needs	C3			
4		Ability to determine when and how to modify a selected approach as necessary in order apply an appropriate level of rigor and best meet the needs of the area of analysis	C4			D65
5		Effectively communicates approach to stakeholders	C5			
6		Effectively gains needed stakeholder and team buy-in to the approach selected	C6			
7		Evaluates based on the big-picture view of the project outside of just the IT domain, vendor domain or just the business unit domain	C8			D57, D334, D336
8		Proactively gathers information from project team members	C9			
9		Resets to the big picture when needed	C10			
10		Displays and maintains a high level of awareness as related to current enterprise architecture and organizational process to ensure all areas impacted have adequate/appropriate stakeholder representation	C12			D50, D53
11		Ability to select and perform a variety of methods to ensure comprehensive representation for all areas potentially impacted in the effort	C13			D50

12		Accurately assesses and identifies the level of stakeholder involvement (how they are involved), level of support for the effort, as well as the best approach on how to and when to strategically engage	C15			D351
13		Ability to assess and identify levels of influence, agendas and authority levels, as well as identify key relationships and dynamics of stakeholder interactions	C16			D351, D354
14		Ability to adjust behavior, communications style and interactions with stakeholders based on stakeholder needs	C17			
15		Effectively builds credibility and trust with stakeholders	C19			D356
16		Successfully communicates and manages stakeholder expectations (no surprises) from the beginning to the end of the effort	C20			
17		Ability to keep stakeholders engaged, responsive and proactive in working toward deliverable goals and objectives	C21			D149
18		Effectively/accurately defines and communicates the activities the team will perform to develop the business analysis activities (work plan) for the effort	C23			
19		Accurately identifies requirements scope and deliverables	C24			D209
20		Provides an accurate estimation of resources necessary to perform requirements tasks (projected schedule and cost estimates/budget impacts)	C25			D355
21		Accurately identifies requirement risks and mitigations	C26			D241
22		Ability to effectively use a variety of estimating techniques to drive precision and accuracy in estimation	C27			
23		Ability to accurately identify comprehensive deliverables and associated tasks required by the effort early in the process	C28			
24		Effectively prioritizes BA work to meet stakeholder needs	C29			
25		Accurately estimates effort required for BA tasks	C30			

26		Develops plan considering geography, culture, formality of organization and frequency needs of stakeholders	C32			D219, D342, D353, D354, D378
27		Displays and maintains complete understanding of how and when the BA will work with project stakeholders for business analysis activities	C33			
28		Defines, monitors and enforces team responsibilities as related to collecting, distributing, accessing and updating requirements information	C34			D66
29		Develops and communicates plan to manage approval of requirements and changes to solution or requirements scope	C36			
30		Effectively manages and executes plan of approval and change to requirements	C37			
31		Displays and maintains appropriate level of	C38			
32		Plans effective prioritization techniques to prioritize requirements for the solution	C39			
33		Accurately assess/identify project and/or business risks and plan risk	C41			D241
34		Ability to provide critical decision support by identifying acceptable risks and outlining risk impact/responses	C42			
35		Effectively communicates risk impact of changes and provides options to manage/mitigate	C43			
36		Selects and performs appropriate techniques to measure business analysis work.	C45			
37		Establishes metrics and measurements to track, assess and report on the quality of work	C46			D240, D243
38		Sets expectation regarding what constitutes effective business analysis work for initiative	C47			
39		Effectively communicates and documents measurement results of business analysis work efforts	C49			

40		Identifies opportunities for improvement of business analysis practices and processes, and identifies preventative or corrective actions for incorporation as improvements into the business analysis plan	C51			
41		Consistently follows and applies organizations methodologies, BA practices, SDLC and compliance requirements	C53			D141
42		Adapts approach to changing strategies, funding decisions, risks and organizational direction	C55			
43		Adapts approach as required to adjust to changing conditions and meet new challenges	C56			
44		Mitigate risks as well as plan for and recover from disasters		B8		
45		Evaluate the total cost of ownership and return on investment for architecture alternatives		B40		
46		Utilize techniques for assessing and managing risk across the portfolio of the enterprise		B41		
47		Initiate, specify, and prioritize information systems projects and to determine various aspects of feasibility of these projects		B52		
48		Manage project teams, including the fundamentals of leadership and team motivation.		B55		D66
49		Manage project communication, both internal to the team, and external to other project stakeholders		B56		
50		Initiate projects, including project selection and defining project scope		B57		
51		Manage project schedules with appropriate techniques and tools.		B58		D337, D343
52		Manage project resources, including human resources, capital equipment, and time		B59		
53		Manage project quality, including the identification of the threats to project quality, techniques for measuring project quality, and the techniques for ensuring project quality is achieved		B60		D238, D240

54		Manage project risk, including the identification of project risk, and the techniques for ensuring project risk is controlled		B61		D337, D338
55		Manage project execution, including monitoring project progress and managing project change, and appropriately documenting and communicating project status		B63		D355, D356
56		Appreciate ethnic cultural differences in working with global teams either internal to organizations or by engaging offshore outsourcers		B67		D157, D148, D353
57		Understand the types of business needs that can be addressed using information technology-based solutions		B69		
58		Manage information systems projects using formal project management methods.		B75		D342
59		Apply information requirements specification processes in the broader systems analysis & design context		B21		D142
60		Evaluate and plan for the integration of emerging technologies		B42		
61		Understand the phases of the project management lifecycle.		B54		D335
62		Outline the system life-cycle and its relationship to security			B52	D143
63		Identify risks associated with disasters or disruptions and specify key mitigation strategies.			B64	
64		Identify the aspects of a business that may be impacted by a security breach or interruption of operation.			B86	
65		Quantify the financial losses associated with potential security breaches and interruption of operations.			B87	
66		Describe the costs associated with actions that can be taken to mitigate security risks.			B89	
67		Describe the need for managing IT resources.			B164	
68		Identify situations in which administrative activities are required			B165	
69		Identify situations which interfere with administrative activities			B166	

70		Identify the stakeholders of a system and formulate their needs			B170	D147, D218, D354
71		Compare and contrast the various requirements modeling techniques			B171	D59, D60, D63
72		Identify and classify the roles played by external users of a system.			B173	D57
73		Explain roles and responsibilities for key project personnel and stakeholders			B198	D354
74		Use appropriate project planning and tracking tools			B199	D333, D344
75						
76	**Elicitation**	Accurately assesses the stakeholders needed to participate in elicitation activities	C58			D361
77		Ability to adjust plan and approach for elicitation activities in light of project and stakeholder schedule needs.	C59			
78		Finds alternative and creative ways to get those involved that are not co-located or unavailable at needed times	C60			
79		Effectively uses a variety of elicitation techniques appropriate to the situation and stakeholder	C62			D140, D348
80		Ability to use a variety of techniques to accurately elicit out requirements when stakeholders are focused on solutions, or are biased, or do not know or understand the scope of the analysis area	C63			D62, D119, D426
81		Accurately assesses when to continue eliciting to uncover further information	C64			
82		Demonstrates the ability uncover additional information from stakeholders when the needed information is not known as important to the stakeholder, but critical to requirements quality	C65			D62

83		Effectively describes to stakeholders the purpose and value of additional elicitation of requirements	C66			
84		Forms and asks probing questions	C67			
85		Accurately captures information in a manner that the stakeholders understand and can review and validate	C69			
86		Accurately translates stakeholder information into solution requirements	C70			
87		Applies active listening to ensure accurate information is captured	C71			D349
88		Ability to ensure that elicitation results link to the business goal/owner and can be measured or decomposed to measurable requirements	C72			
89		Accurately validates that the documented requirements match the intention of the stakeholders needs	C74			D150
90		Communicate effectively with various organizational stakeholders to collect information using a variety of techniques and to convey proposed solution characteristics to them.		B74		
91		Distinguish between non-functional and functional requirements			B172	
92		Explain how requirements gathering fits into a system development lifecycle.			B178	D12, D65, D143
93						
94	**Requirements Management and**	Accurately baselines requirements	C76			
95		Consistently obtains timely stakeholder sign-off of requirements	C77			
96		Consistently identifies requirements change and acts to manage change	C79			
97		Regularly manages stakeholder expectations	C80			
98		Effectively gauges and acts on the need to educate stakeholders on change management	C81			D221
99		Accurately assesses impact of change to business case; communicates impact and facilitates stakeholder consensus	C82			

100		Effectively maintains consensus among stakeholders on solution scope	C84			
101		requirements issue versus project issue and escalates appropriately	C85			
102		Collaborates effectively with PM on issues and conflicts that impact time, cost, scope, quality and risk	C86			D350
103		Correctly tracks, communicates and proactively follows up on issues. Actively ensures the right people are aware of issues and thoroughly documents resolution	C87			D127
104		Actively monitors resolution progress and success	C88			D127
105		Effectively uses a variety of techniques to manage conflict	C89			
106		Successfully negotiates conflicts to a win/win	C90			D350
107		Maintains collaborative style with team members and stakeholders	C91			
108		Maintains composure and self-control around conflict	C92			
109		Consistently receives feedback from stakeholders that satisfactory resolution was reached	C93			
110		Develops and maintains the correct level of traceability appropriate for the work effort	C95			
111		Correctly traces solution requirements backwards and forwards	C96			
112		Systematically ensures requirements are organized to enable quality traceability	C97			
113		Consistently uses traceability to enable quality impact analysis	C99			
114		Consistently uses traceability to manage requirements risk	C100			
115		Consistently uses traceability to manage requirements change	C101			D236
116		Consistently uses traceability requirement dependency to assist with requirement prioritization	C102			
117		Consistently uses traceability to collaborate with project teams (quality assurance, business testing teams, project management, etc . . .)	C103			

118		Ability to assess how much requirements traceability is required to manage risk	C104			
119		Accurately assesses which requirements will add value to the organization by leveraging reuse	C106			
120		Consistently develops and applies reuse standards of requirements maintenance	C107			
121		Demonstrates understanding of benefits of maintaining requirements	C108			
122		Creates comprehensive work products documenting solution requirements	C110			
123		Accurately assesses the needs of the audience to develop work products at the appropriate level of detail to communicate to audience	C111			
124		Effectively uses the requirements package as a basis for solution design and implementation	C112			
125		Ability to accurately assess and determine when a requirements set is at the appropriate level of rigor sufficient to support development or make a solution decision	C113			
126		Applies experience and knowledge of a variety of presentation techniques for requirements	C115			D346, D347
127		Effectively formats and presents requirements in a manner appropriate to stakeholder	C116			D346, D347, D351
128		Successfully uses requirements package iteratively to communicate a potentially different package to different audiences	C117			
129		Effectively reviews requirements with all stakeholders informally and formally	C119			
130		Consistently works to facilitate a common understanding of requirements through various communication techniques	C120			
131		Effectively uses alternative visual and contextual methods to communicate	C121			
132		Effectively communicates to stakeholders by using the appropriate level of detail for the audience	C123			
133		Communicates effectively to executive level stakeholders	C124			

134		Communicates effectively to users and technical stakeholders	C125			D70, D145
135		Communicates effectively to external vendors and stakeholders	C126			
136		Accurately identifies additional stakeholders that need to be included and understand impact	C128			
137		Effectively analyzes cost/benefit and risk of change	C129			
138		Consistently analyzes if the change impacts the business case versus just the project plan	C130			
139		Consistently analyzes if the change improves business case or negates it	C131			
140		Consistently analyzes if the change has cross impacts to other initiatives	C132			
141		Control projects through information tracking and cost and change control techniques		B64		
142		Within the context of the methodologies they learn, write clear and concise business requirements documents and convert them into technical specifications		B73		D207, D209
143		Communicate effectively with various organizational stakeholders to collect information using a variety of techniques and to convey proposed solution characteristics to them.		B74		
144		Describe the basic elements of group dynamics.			B221	D71
145		Compare and contrast different conflict resolution strategies.			B222	D350
146		Write a technical memo to management			B215	D216, D347
147		Create a set of technical requirements for an IT			B217	D207, D209, D216
148		Compare and contrast technical writing and expository writing.			B218	
149						
150	**Enterprise Analysis**	Accurately identifies why a change to a system, process or capability is needed	C134			
151		Ensures the business need aligns to business goals and objectives	C135			
152		Differentiates and understands both strategic and tactical business needs	C136			

153		Effectively uses decomposition of goals to define achievable objectives and measures in work effort	C137			
154		Accurately articulates the essence of stakeholder vision while appropriately questioning the assumptions and constraints buried in stakeholder statements of requirements	C138			
155		Effectively recognizes opportunities beyond the underlying business needs and issues	C140			
156		Successfully helps stakeholders see areas of opportunity and facilitates exploration	C141			
157		Demonstrates a broad knowledge of general business functions: finance, marketing, hr, supply chain, customer service, etc, . . .	C143			D54
158		Understands general relationships between various business units	C144			D54
159		Understands how business units serve the organization as whole	C145			
160		Understands how the organization operates within the domain/industry and demonstrates the understanding of domain components	C146			
161		Understands an organization's strategic intents	C147			
162		Understands KPIs of an organization	C148			
163		Understands business change drivers	C149			
164		Effectively uses organizational networks/relationships to influence work outcomes and decisions	C151			
165		Effectively uses organizational authority structures to facilitate decision making and escalation of issues	C152			
166		Effectively utilizes communication structures within the organization to influence work outcomes	C153			
167		Appropriately adjusts own behaviors to culture of business work group	C154			D219, D378
168		Understands the framework (structure, people, processes and technology) that supports the organization's strategy	C155			D47, D48, D49, D52

169		Accurately identifies current enterprise business capabilities	C156			
170		Accurately identifies gaps that prevent the organization from achieving desired outcomes	C157			
171		Accurately identifies shortcomings, problems and limitations of existing solution	C158			D144
172		Effectively facilitates idea generation	C160			D62
173		Effectively works with stakeholders to identify alternative solutions	C161			D62
174		Accurately identifies assumptions and constraints	C162			D62
175		Accurately assess the organizations readiness for proposed approach	C164			
176		Effectively communicates possible solution approaches to stakeholders	C165			
177		Consistently captures information about each option to facilitate effective review of options	C166			
178		Provides a structure and process to ranking and weighing options for effective decision making by stakeholders	C167			
179		Accurately conceptualizes the recommended solution; enables stakeholders to understand the new capabilities	C169			
180		Accurately defines in-scope and out-of-scope in terms of the solution boundaries to meet the business case	C170			D211
181		Accurately defines implementation approach of selected solution by defining how the project will deliver the solution scope.	C171			D52, D58
182		Accurately defines dependencies, constraints and assumptions (technical and business) of the solution scope	C172			
183		Works with stakeholders to define benefits and linkage to the measures of success of proposed solution	C174			
184		Works with stakeholders in ensuring the needed level of research is completed to accurately define the solution benefits and risks	C175			

185		Accurately represents the benefits of the proposed solution	C176			
186		Effectively communicates how the proposed solution will achieve business objectives.	C177			
187		Accurately assesses costs and risks of the proposed solution	C178			
188		Effectively presents the information needed to facilitate a decision to invest and move forward with the proposed solution	C180			
189		Understand how various types of information systems provide the information needed to gain business intelligence to support the decision making for the different levels and functions of the organization.		B11		
190		Understand how enterprise systems foster stronger relationships with customers and suppliers and how these systems are widely used to enforce organizational structures and processes		B12		
191		Understand the value of information systems investments as well as learn to formulate a business case for a new information system, including estimation of both costs and benefits		B6		D46
192		Understand how organizations develop and acquire information systems and technologies		B13		
193		Understand how and why information systems are used today.		B2		D46
194		Explain the technology, people, and organizational components of information systems.		B3		
195		Understand globalization and the role information systems has played in this evolution		B4		
196		Understand how businesses are using information systems for competitive advantage vs. competitive necessity		B5		D46

197		Understand a variety of frameworks for enterprise architecture analysis and decision making.		B39		
198		Understand the core concepts of data/information architecture and evaluate existing data/information architecture designs		B46		D103, D106, D110
199		Understand the integration of enterprise systems with interorganizational partners such as suppliers, government, etc.		B50		
200		Clearly define problems, opportunities, or mandates that initiate projects.		B71		D144
201		Understand the various functions and activities within the information systems area, including the role of IT management and the CIO, structuring of IS management within an organization, and managing IS professionals within the firm		B83		
202		View an organization through the lens of non-IT senior management in deciding how information systems enable core and supportive business processes as well as those that interface with suppliers and customers		B84		
203		Understand the concepts of information economics at the enterprise level.		B85		
204		Appreciate how IS represents a key source of competitive advantage for firms.		B86		
205		Structure IS-related activities to maximize the business value of IS within and outside the company.		B87		
206		Understand existing and emerging information technologies, the functions of IS and its impact on the organizational operations		B88		D133

207		Evaluate the issues and challenges associated with successfully and unsuccessfully incorporating IS into a firm.		B89		
208		Understand how strategic decisions are made concerning acquiring IS resources and capabilities including the ability to evaluate the different sourcing options.		B90		D358
209		Apply information to the needs of different industries and areas		B91		
210		Understand the role of IT control and service management frameworks from the perspective of managing the IS function in an organization		B92		
211		Understand the fundamentals of enterprise systems and issues associated with their implementation		B114		D425
212		Evaluate the costs and benefits of implementing an enterprise system		B115		D423
213		Understand how enterprise systems integrate functional areas into one enterprise wide information system.		B116		
214		Explain how “best practices” are incorporated in		B117		
215		Recognize how an organizational process often spans different functional areas		B118		
216		Describe the role of enterprise systems in carrying out processes in an organization		B119		D423
217		Learn to integrate key concepts from functional-oriented courses, such as accounting, marketing, and organizational behavior, to promote the development of integrative skills		B120		
218		Explain how integrated information sharing increases organizational efficiencies		B121		
219		Identify, describe, and evaluate the major enterprise system software providers and their packaged systems.		B122		D423, D427
220		Understand current trends related to enterprise systems		B123		
221		Discuss the relationship between business processes and system integration.			B203	D106

222		Discuss the need to take the current IT environment into account in defining a system architecture and in system integration.			B204	D53
223		Discuss the importance of organizational culture in any system integration project			B205	
224		Explain “architecture” in the context of system			B207	D49, D50
225		Explain how complex systems can be represented using architectural views and how this facilitates system evolution over time.			B208	
226		Explain how some specific architectural views relate to the system lifecycle			B209	D56
227		Give examples of architectural frameworks and associated best practice models (SOA, Zachman Framework, ITIL, COBIT, ISO 20,000).			B210	
228		Give examples of modeling tools that support description and management of architectural views			B211	
229		Explain how the components of an IT system interrelate.			B2	D47
230		Explain how and why complexity occurs in IT.			B3	
231		Explain how organizational context is influenced by and impacts the development and deployment of IT systems.			B11	
232		Illustrate the use of information and communication technologies to solve problems as an IT professional.			B9	
233		Explain why data backup is important and how organizations use backup and recovery systems			B107	D103, D107
234						
235	**Requirements Analysis**	Effectively works among stakeholders to build consensus on requirements prioritization to ensure the analysis and implementation is focused on the most critical requirements	C182			

236		Accurately reflects the requirements priority according to stakeholder input on business value and risk	C183			
237		Accurately reflects the requirements priority according to stakeholder input on impact of requirements on solution as a whole	C184			
238		Understands and communicates the value of requirements prioritization to the various project and solution stakeholders	C185			
239		Creates prioritization attributes appropriate to work effort	C186			
240		Applies business principles and performance measures to facilitate requirements prioritization	C187			
241		Maintains neutrality among team and organizational politics when prioritizing; focused on business value and business case	C188			
242		Effectively organizes requirements in views that are understandable from all stakeholder perspectives.	C190			
243		Clearly articulates the relationships between the various requirements, stakeholder needs and models	C191			
244		Identifies and recommends the use of repeatable patterns where appropriate	C192			
245		Demonstrates understanding of which requirements models and formats are appropriate for the business domain, solution scope and stakeholder audience	C193			D60
246		Clearly aligns levels of abstraction in requirements to stakeholder needs	C194			
247		Clearly expresses stakeholder desires and/or current organizational state using a combination of textual formats, models, diagrams and matrices	C196			
248		Consistently leverages models and specifications to provide insight into opportunities for improvement	C197			D208, D214
249		Effectively uses matrices to organize requirements and represent relationships between requirements.	C198			

250		Appropriately uses models to represent a simplified view of a complex reality	C200			D137, D138, D139, D208
251		Ensures that information captured in different models is consistent and accurate	C201			
252		Effectively uses models as a tool to document requirements and also a tool to aide in elicitation activities	C202			
253		Effectively uses formal and informal modeling as appropriate to the audience Ensures that information captured in different models is consistent and accurate	C203			
254		Accurately identifies assumptions and constraints	C205			D207
255		Confirms accuracy of assumptions and constraints	C206			
256		Consistently considers various types of assumptions and constraints: technical and business	C207			
257		Consistently ensures that requirements are ready for review by stakeholders	C209			
258		Accurately assess the quality of requirements and characteristics of requirements that signify quality (cohesive, complete, consistent, correct, feasible, modifiable, unambiguous and testable)	C210			
259		Iteratively checks work in progress for quality attributes	C211			
260		Iteratively compares varying requirements deliverables to one another checking for consistency	C212			
261		Appropriately uses text to describe one and only one requirement at a time	C213			
262		Effectively manages conflicting needs and expectations exposed in the requirements validation process	C215			
263		Accurately assesses that all requirements can demonstrate delivery of value	C216			
264		Initiate, specify, and prioritize information systems projects and to determine various aspects of feasibility of these projects		B70		
265		Use contemporary CASE tools for the use in process and data modeling		B77		D121
266		Model business processes		B102		

267		Understand different approaches to business process modeling and improvement		B109		
268		Use basic business process modeling tools		B111		
269		Use at least one conceptual data modeling technique (such as entity-relationship modeling) to capture the information requirements for an enterprise domain.		B22		D125, D118
270		Link to each other the results of data/information modeling and process modeling.		B23		D59, D109, D121, D137
271		Manage proliferating types and volume of content		B44		
272		Create a simple Entity Relationship diagram			B110	D121
273		Describe and interpret Enhanced Entity			B111	D121
274		Describe the relationship between a logical model and a physical model			B113	D120
275		Explain the use of CASE tools in data modeling			B115	D109
276		Select appropriate business rules for a given scenario			B112	
277		Explain and give examples of use cases			B174	D60, D139, D210
278		Explain the structure of a detailed use case			B175	D60, D139, D210
279		Detail a use case based on relating functional requirements			B176	D210
280		Describe the types of event flows in a use case and under which conditions they occur.			B177	D60, D139, D210
281		Explain how use cases drive testing throughout the system lifecycle.			B179	D210, D215, D220
282						
283	**Solution Assessment**	Accurately determines if the solution delivers enough value to justify implementation	C218			
284		Effectively communicates recommendation of solution justification to move forward	C219			
285		Demonstrates understanding of advantages and disadvantages of alternative solutions	C220			
286		When multiple solutions are available, effectively evaluates which option will deliver the greatest business value	C221			
287		Assesses tradeoffs between options to maximize benefits and minimize cost	C223			

288		Demonstrates usage of various allocation categories (release, solution component, business unit, etc . . .) and uses the most appropriate given the point in time in the project	C224			
289		Consistently uses allocation throughout the project lifecycle to maximize business value	C225			
290		Effectively communicates solution impact to stakeholders	C227			
291		Demonstrates understanding of the changes that will occur with the new solution (business area, technical infrastructure, processes and operations)	C228			
292		Accurately assesses stakeholder beliefs, attitudes and willingness to adapt to new solution	C229			
293		Demonstrates understanding of the forces that support and oppose the change and works to strengthen support	C230			
294		Facilitates requirements for transition of data	C232			
295		Facilitates requirements for the transition of	C233			
296		Facilitates requirements for needed training	C234			
297		Facilitates discussions on operational change needs due to new solution being in place	C235			
298		Develops acceptance criteria and a plan to evaluate	C237			D427
299		Facilitates acceptance of the solution	C238			
300		Accurately ensures that the solution performs to meet the business requirements	C239			D113
301		Assess the effect and impact a defect or issue has on the business value of the solution	C241			
302		Effectively prioritizes defects and issues with the solution	C242			
303		Effectively evaluates defects and issues for potential workarounds that are acceptable until defect can be addressed	C243			

304		Proactively investigates how a solution is actually used after it is deployed	C245			
305		Proactively seeks to identify how the users have adapted and/or modified the solution and why	C246			
306		Validates the previously defined performance metrics for the solution	C247			D243
307		Effectively communicates to stakeholders how the solution is performing in relationship to the business goals and objectives.	C248			
308		Understand the foundations of project management, including its definition, scope, and the need for project management in the modern organization		B53		D335
309		Articulate various systems acquisition alternatives, including the use of packaged systems (such as ERP, CRM, SCM, etc.) and outsourced design and development resources.		B76		D423
310		Compare the acquisition alternatives systematically		B78		D427, D430
311		Benchmark business processes performance		B103		
312		Assess business processes performance		B104		
313		Design business process improvements		B105		
314		Understand the role and potential of IT to support business process management		B106		
315		Understand the challenges of business process change		B107		
316		Understand how to support business process change		B108		
317		Understand the challenges and risks concerning business process outsourcing, especially those dealing with ethnic cultural differences from offshore engagements		B110		
318		Simulate simple business processes and use simulation results in business process analysis		B112		
319		Differentiate between build and buy in software and hardware acquisition			B181	D341, D424
320		and buying in general			B182	D424

321		Differentiate between in-sourcing and out-sourcing for the acquisition of IT services, including support			B183	D331
322		Explain the advantages and drawbacks of in-sourcing and out-sourcing in general.			B184	D341
323		Explain the importance of testing, evaluation and benchmarking in any IT sourcing decision.			B185	
324		Explain the primary components in an RFP			B186	D331, D429
325		Explain the advantages and drawbacks of using			B187	
326		Explain the elements in a well-structured contract			B188	D331
327		Explain the importance of a well-structured contract in any IT sourcing decision			B189	
328		Given an RFP, recommend and justify one or more products that satisfy the criteria of the RFP.			B194	D429
329		Explain the importance of a cost/benefit analysis to the successful implementation of a project plan			B197	
330		List issues that should be considered when deciding whether to create new software or adapt existing software to solve a problem			B125	D424
331		Identify situations in which a support organization needs to be consulted in resolving application issues			B161	
332		Prepare and deliver an oral presentation for a user audience			B213	D126, D239
333		Prepare and deliver an oral presentation for a management audience			B214	
334						
335	**Analytical Thinking and Problem Solving**	The successful generation and productive consideration of new ideas	C250			
336		Application of new ideas to resolve existing problem	C251			

337		Willingness of stakeholders to accept new approaches	C252			
338		Confidence of the participants in the decision-analysis process that a decision is correct	C254			
339		New information or alternatives that cause a decision to be revisited are genuinely new and not simply overlooked	C255			
340		Decisions are effective in addressing the underlying problem	C256			
341		The impact of uncertainty and new information when making decisions can be effectively assessed	C257			
342		Agreement by stakeholders that analysis models effectively and completely describe the domain	C259			
343		Identification of related problems or issues from multiple areas in the domain	C260			
344		Rapid absorption of new information or new domains	C261			
345		Confidence of the participants in the problem-solving process that a selected solution is correct	C263			
346		New solution options can be evaluated effectively using the problem solving framework	C264			
347		Selected solutions meet the defined objectives and solve the underlying problem	C265			D430
348		The problem-solving process avoids making decisions based on preconceived notions, organizational politics or other traps that may cause a sub-optimal solution to be selected	C266			
349		Understanding of how a change to a component affects the system as a whole	C268			D221, D242
350		Identification of reinforcing and compensating feedback loops	C269			
351		Understanding of how systems adapt to external pressures and changes	C270			
352		Understand how information systems are enabling new forms of commerce between individuals, organizations, and governments		B9		

353		Be aware of emerging technologies that enable new forms of communication, collaboration, and partnering		B10		
354		Interpret the social context of a particular information technology implementation.			B229	
355		Evaluate a particular implementation through the use of empirical data.			B230	
356		Describe positive and negative ways in which information technology alters the modes of interaction between people			B231	
357		Analyze and explain the behavior of simple programs involving the fundamental programming constructs covered by this unit.			B138	D20
358		Modify and expand short programs that use standard conditional and iterative control structures and functions			B139	D16
359		Design, implement, test, and debug a program that uses each of the following fundamental programming constructs: basic computation, simple I/O, standard conditional and iterative structures, and the definition of functions			B140	D29, D10, D25
360		Choose appropriate conditional and iteration constructs for a given programming task.			B141	D22, D36
361		Apply the techniques of structured (functional) decomposition to break a program into smaller pieces			B142	D35
362		Describe the mechanics of parameter passing and the issues associated with scoping			B143	D31
363		Describe the concept of recursion and give examples of its use.			B144	D20
364						
365	**Behavioral Characteristics**	Decisions are made with due consideration to the interests of all stakeholders	C272			
366		Reasons for a decision are clearly articulated and understood	C273			
367		Prompt and full disclosure of potential conflicts of interest	C274			

368		Honesty regarding one's abilities, the performance of one's work and accepting responsibility for failures or errors	C275			D28, D136, D153, D245, D224
369		The ability of the business analyst to find information	C277			D155
370		Regular on-time completion of task	C278			D44, D152, D222, D362, D364, D384
371		Efficiency in the completion of work	C279			
372		The ability to easily identify all outstanding work and the status of each work item	C280			
373		Stakeholders involving the business analyst in decision-making	C282			
374		Stakeholder acceptance of the business analyst's recommendations	C283			
375		Willingness of stakeholders to discuss difficult or controversial topics with the business analyst	C284			
376		Willingness of stakeholders to support or defend the business analyst when problems occur	C285			
377		Identify the strengths and weaknesses of relevant professional codes as expressions of professionalism and guides to decision-making			B258	
378		Identify ethical issues that arise in the information technology field and determine how to address them technically and ethically			B259	D135, D228, D229, D365, D383
379		Apply appropriate professional codes of conduct in assignments.			B260	D43, D245, D385, D402
380		Identify progressive stages in a whistle-blowing incident.			B261	
381		List the underlying philosophical aspects of ethical decision making			B262	D244
382		Identify how information technology is affected by workplace issues such as harassment and discrimination.			B263	
383		Identify how society has been affected by identify theft and what to do to protect individuals			B264	
384		Compare and contrast two published codes of ethics			B265	
385						

386	**Business Knowledge**	Understanding of business environments, operations, process and practices relating to: - Common business management and decision making concepts, principles activities and practices - Typical organization structures, job functions and work activities	C287			D54
387		Understanding of relevant regulatory, compliance and governance frameworks	C288			
388		Understanding of auditing and security issues	C289			
389		Understanding of industry related material and keeps abreast of what is taking place in the industry	C291			
390		The ability to identify key trends shaping the industry	C292			
391		Knowledge of major competitors and partners for the organization	C293			
392		Knowledge of major customer segments	C294			
393		Knowledge of common products and product types	C295			
394		Knowledge of sources of information about the industry, including relevant trade organizations or journals	C296			
395		Understanding of industry-specific resource and process documents	C297			
396		Understanding of industry standard processes and methodologies	C298			
397		Understanding of the industry regulatory environment	C299			
398		Understanding of terminology or jargon used in the organization	C301			
399		Understanding of the products or services offered by the organization	C302			
400		Ability to identify subject matter experts in the organization	C303			
401		Organizational relationships and politics	C304			
402		Reduced time or cost to implement a required change	C306			

403		Shortened time on requirements analysis and/or solution design	C307			
404		Understanding when a larger change is justified based on business benefit	C308			
405		Understanding how additional capabilities present, but not currently used, in a solution can be deployed to provide business value	C309			D46
406		Explain the relationship between IT and related and informing disciplines.			B16	
407		Explain how and to what extent IT has changed various application domains.			B18	
408		world economy, culture, political systems, health, security, warfare, etc.			B19	D133
409						
410	**Communication Skills**	Effectively paraphrasing statements to ensure understanding	C311			
411		Effectively facilitating sessions, ensuring success through preparedness and co-ordination	C312			D146
412		Developing and delivering powerful presentations by positioning content and objectives appropriately (i.e. positive versus negative tone)	C313			
413		Can communicate the criticality or urgency of a situation in a calm, rational manner with proposed solutions	C314			
414		Verifying that learners have acquired information that has been imparted to them	C316			
415		Ability of learners to use new skills or demonstrate new knowledge	C317			
416		Ability to adjust the style of writing for the needs of the audience	C319			D70, D145
417		Proper use of grammar and style	C320			
418		Appropriate choice of words	C321			
419		Ability of the reader to paraphrase and describe the content of the written communication	C322			
420						
421	**Interaction Skills**	Ensuring that participants in a discussion	C324			

422		Use of meeting management skills and tools (including agendas and the use of meeting minutes to keep discussions focused and organized	C325			D127, D128
423		Preventing discussions from being sidetracked onto irrelevant topics	C326			
424		Identifying common areas of agreement	C327			
425		Effective use of different negotiation styles	C328			
426		Ability to identify important issues	C329			
427		Understanding and considering all parties'	C330			
428		Encouraging stakeholders to reach win/win outcomes on a regular basis	C331			D350
429		Understanding of political implications in conflicts and negotiates in a politically sensitive manner	C332			
430		Understanding the impact of time and timing on negotiations	C333			
431		Reduced resistance to necessary changes	C335			
432		Team members and stakeholders demonstrating a willingness to set aside personal objectives when necessary	C336			D379, D400
433		Articulation of a clear and inspiring vision of a desired future state	C337			
434		Fostering a collaborative working environment	C339			
435		Effective resolution of conflict	C340			D350
436		Developing trust among team members	C341			D71, D130, D131
437		Support among the team for shared high standards of achievement	C342			
438		Team members have a shared sense of ownership of the team goals	C343			D71, D352, D400
439						
440	**Software Applications (General & Specialized)**	Ability to apply an understanding of one tool to other similar tools	C345			
441		Able to identify major tools in the marketplace and describe how they are used in any given situation	C346			
442		Understands and is able to use most of the major features of the tool	C347			
443		Able to use the tools to complete requirements-related activities more rapidly than is possible without them	C348			
444		Able to track changes to the requirements made through the tools	C349			

(Topi et al., 2010, p. 35-70; Lunt et al., 2008, p. 68-139; International Institute of Business Analysis, 2011, p. 31-41)

Appendix J CIT Information Systems Technology Plan of Study

DEPARTMENT OF COMPUTER & INFORMATION TECHNOLOGY
INFORMATION SYSTEMS TECHNOLOGY CONCENTRATION (IST) **Effective Fall 2012**

FIRST SEMESTER					SECOND SEMESTER				
COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM	COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM
CNIT 18000 (Intro to Systems Dev)		3			CNIT 15500 (Intro to Software Dev Concepts)		3		
ENGL 10600 (First-Year Composition)		4			CNIT 17600 (Info Tech Architectures)		3		
IT 10400 (Industrial Organization)		3			COM 11400 (Fund of Speech Communication)		3		
MA 22300 (Intro Analysis I)		3			MA 22400 (Intro Analysis II)		3		
TECH 12000 (Technology & the Individual)		3			OLS 25200 (Human Relations in Organizations)		3		
TOTAL CREDIT HOURS		16			TOTAL CREDIT HOURS		15		

THIRD SEMESTER					FOURTH SEMESTER				
COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM	COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM
CNIT 25500 (Intro to Obj-Oriented Prog)		3			CNIT 24200 (System Administration)		3		
CNIT 27200 (Database Fundamentals)		3			CNIT 28000 (Sys Analysis & Design Methods)		3		
Communications Selective[1]		3			CNIT 31500 or CNIT 32500 (Sys Prog or Obj-Oriented Application Dev)		3		
Problem Solving Selective[2]		3			Accounting Selective[4**]		3		
Economics Selective[3*]		3			Statistics Selective[5]		3		
TOTAL CREDIT HOURS		15			TOTAL CREDIT HOURS		15		

FIFTH SEMESTER					SIXTH SEMESTER				
COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM	COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM
CNIT 38000 (Adv Analysis & Design)		4			Information Systems Selective[9]		3		
CNIT 37200 or CNIT 39200 (DB Prog or Enterp. Data Mgmt)		3			Information Systems Selective[9]		3		
Free Elective[6] (Any non-remedial course)		3			Professional Writing Selective[10]		3		
Professional Speaking Selective[7]		3			Interdisciplinary Selective-Mkg or Manufacturing[8]		3		
Interdisciplinary Selective-Finance[8]		3			TECH 32000 (Technology & the Organization)		3		
TOTAL CREDIT HOURS		16			TOTAL CREDIT HOURS		15		

SEVENTH SEMESTER					EIGHTH SEMESTER				
COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM	COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM
Information Systems Selective[9]		3			CNIT 48000 (Managing Info Tech Projects)		3		
Information Systems Selective[9]		3			Information Systems Selective[9]		3		
Interdisciplinary Selective-Business Law[8]		3			Interdisciplinary Selective-Quality Control[8]		3		
TECH 33000 (Tech & the Global Society)		3			Interdisciplinary Selective-OBHR[8]		3		
Liberal Arts Selective[11]		3			Liberal Arts Selective[11]		3		
TOTAL CREDIT HOURS		15			TOTAL CREDIT HOURS		15		

Total Credit Hours: 122

•A MINIMUM GRADE OF "C" IS REQUIRED IN ALL PREREQUISITE CNIT COURSES. IF YOU EARN A "D" IN A CNIT COURSE THAT IS NOT USED AS A PREREQUISITE, YOU NEED NOT RETAKE THE CLASS.
•EFFECTIVE FALL 2002: A MINIMUM GRADE POINT AVERAGE OF 2.0 IS REQUIRED IN CNIT COURSES
•CNIT COURSES MAY BE TAKEN NO MORE THAN THREE TIMES (INCLUSIVE OF W, WF or WN and I GRADES) IN ORDER TO FULFILL THE ABOVE DEGREE REQUIREMENTS. STUDENTS NOT FULFILLING THIS POLICY MUST WITHDRAW FROM THE PROGRAM.

UPDATED 6/8/2012

[8] **Interdisciplinary Selectives: 15 Total Credits required. No more than one course can be selected from each of the five categories.**

Courses subject to availability.

Finance	IT 45000	Production Cost Analysis
	IET 45100	Monetary Analysis for Industrial Decisions
	MGMT 20100	Management Accounting I
	MGMT 30400	Introduction to Financial Management
Manufacturing or Marketing	MFET 40000	Computer-Integrated Manufacturing
	MFET 24300	Automated Manufacturing I
	MET 45100	Manufacturing Quality Control
	IT 34500	Automatic Identification and Data Capture
	MGMT 32300	Introduction to Marketing Analysis
Business Law	MGMT 45500	Legal Background for Business I
Quality Control	OLS 48400	Leadership Strategies for Quality and Productivity
	IT 34200	Introduction to Statistical Quality
	MFET 45100	Manufacturing Quality Control
	MET 45100	Manufacturing Quality Control
Organizational Behavior and Human Resources	COM 32400	Introduction to Organizational Communication
	ENTR 20000	Introduction To Entrepreneurship And Innovation
	ENTR 31000	Marketing and Management for New Ventures
	OBHR 30000	Management of Human Resources
	OLS 37500	Training Methods
	OLS 37600	Human Resource Issues
	OLS 38600	Leadership for Organizational Change
	OLS 47700	Conflict Management
	PSY 27200	Introduction to Industrial Organizational Psychology

The above selectives may be replaced by a planned alternate sequence of Interdisciplinary selectives which reflect a subject of interest to which computing can be applied. Proposals for special options must be submitted in writing to Professor Jeffrey Brewer jbrewer@purdue.edu.

[1] **Communications Selective*** COM 21000, COM 21200, COM 31400, COM 31500, COM 31800, COM 32000, COM 32400

[2] **Problem Solving Selective*** CHM 11100,CHM 11500,PHIL 12000,PHIL 15000,PHYS 17200,PHYS 21800,PHYS 21900,PHYS 22000,PHYS 22100

[3] **Economics Selective*** **AGEC 21700, ECON 21000***, ECON 25100, ECON 25200*

[4] **Accounting Selective*** MGMT 20000 **(Required for MGMT Minor)**, MGMT 20010 (Intro Accounting for Non-MGMT Majors)**

[5] **Statistics Selective*** STAT 22500, STAT 30100, STAT 50100, STAT 51100

[6] **Free Elective*** Any non-remedial course (see CIT No Credit List @ www.tech.purdue.edu/cit/academics/undergradute/curricula/index.cfm)

[7] **Professional Speaking Selective*** COM 31500, COM 32000, COM 32500, COM 41500

[8] **See above Interdisciplinary Selectives**

[9] **Information Systems Selective*** Any 30000 level or higher CNIT course or EPICS (EPCS): participation in EPICS requires CIT faculty approval for project content. Many EPICS projects require at least two semesters to earn 3 credits.

[10] **Professional Writing Selective*** ENGL 42000, ENGL 42100

[11] **Liberal Arts Selective*** ANTH: AD: BAND: CLCS: COM: ECON: EDCI: EDPS: EDST: ENGL: FLL: HIST: HONR: IDIS: LING: MODERN LANGUAGES: MUS: PHIL: POL: SCI: PSY: SOC: THTR: HDFS 20100 or HDFS 25500 (HDFS previously CDFS): MODERN LANGUAGES: ARAB, CHNS, FR, GER, ITAL, JPNS, PTGS, RUSS, SPAN

***Only one of the following: AGEC 21700 or ECON 21000 can be taken for credit on the CIT plan of study.**
****Only one of the following: MGMT 20000 or MGMT 20010 can be taken for credit on the CIT plan of study.**

Students must adhere to plan of study requirements in place at the time of admission.
Selective course choices are subject to change due to availability; current listings will be made available to students during registration.

Appendix K CIT Network Engineering Technology Concentration Plan of Study

DEPARTMENT OF COMPUTER & INFORMATION TECHNOLOGY
NETWORK ENGINEERING TECHNOLOGY CONCENTRATION (NET) **Effective Fall 2012**

FIRST SEMESTER					SECOND SEMESTER				
COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM	COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM
CNIT 18000 (Intro to Systems Dev)		3			CNIT 15500 (Intro to Software Dev Concepts)		3		
ENGL 10600 (First-Year Composition)		4			CNIT 17600 (Info Tech Architectures)		3		
IT 10400 (Industrial Organization)		3			COM 11400 (Fund of Speech Communication)		3		
MA 22300 (Intro Analysis I)		3			MA 22400 (Intro Analysis II)		3		
TECH 12000 (Technology & the Individual)		3			OLS 25200 (Human Relations in Organizations)		3		
TOTAL CREDIT HOURS		16			TOTAL CREDIT HOURS		15		

THIRD SEMESTER					FOURTH SEMESTER				
COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM	COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM
CNIT 24000 (Data Comm & Networking)		3			CNIT 24200 (System Administration)		3		
CNIT 25500 (Intro to Obj-Oriented Prog)		3			CNIT 28000 (Sys Analysis & Design Methods)		3		
CNIT 27200 (Database Fundamentals)		3			CNIT 31500 (Systems Programming)		3		
ECET 22400[1] (Electronic Systems)		3			Statistics Selective[2] (e.g. STAT 30100)		3		
Physics Selective I[3] (e.g. PHYS 21800)		4			Physics Selective II[4] (e.g. PHYS 21900)		4		
TOTAL CREDIT HOURS		16			TOTAL CREDIT HOURS		16		

FIFTH SEMESTER					SIXTH SEMESTER				
COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM	COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM
CNIT 34000 (UNIX Administration)		3			CNIT 34200 (Adv Syst & Network Adm)		3		
CNIT 34500 (Internetwork Design & Implem)		3			CNIT 34600 (Wireless Networks)		3		
ECET 37400 (Digital Telecommunications)		3			Professional Writing Selective[6]		3		
Professional Speaking Selective[5]		3			Information Systems Selective[7]		3		
TECH 32000 (Technology & the Organization)		3			TECH 33000 (Technology & the Global Society)		3		
TOTAL CREDIT HOURS		15			TOTAL CREDIT HOURS		15		

SEVENTH SEMESTER					EIGHTH SEMESTER				
COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM	COURSE REQUIREMENT	SUB/EQUIV	CR	GR	SEM
CNIT 45500 (Network Security)		3			CNIT 48000 (Managing Info Tech Projects)		3		
NET Selective[8]		3			NET Selective[8]		3		
Information Systems Selective[7]		3			Business & Economic Selective[9]		3		
Business & Economic Selective[9]		3			Communications Selective[10]		3		
Liberal Arts Selective[11]		3			Liberal Arts Selective[11]		3		
TOTAL CREDIT HOURS		15			TOTAL CREDIT HOURS		15		

Total Credit Hours: 123

•A MINIMUM GRADE OF "C" IS REQUIRED IN ALL PREREQUISITE CNIT COURSES. IF YOU EARN A "D" IN A CNIT COURSE THAT IS NOT USED AS A PREREQUISITE, YOU NEED NOT RETAKE THE CLASS.
•EFFECTIVE FALL 2002: A MINIMUM GRADE POINT AVERAGE OF 2.0 IS REQUIRED IN CNIT COURSES
•CNIT COURSES MAY BE TAKEN NO MORE THAN THREE TIMES (INCLUSIVE OF W, WF or WN and I GRADES) IN ORDER TO FULFILL THE ABOVE DEGREE REQUIREMENTS. STUDENTS NOT FULFILLING THIS POLICY MUST WITHDRAW FROM THE PROGRAM.

UPDATED 6/8/2012

[9] **BUSINESS AND ECONOMICS SELECTIVES (6 Credits Required): (subject to availability)**
(Select any two courses, except as indicated with "or": these courses are equivalent.)

Finance	IT 45000	Production Cost Analysis
	IET 45100	Monetary Analysis for Industrial Decisions
	MGMT 30400	Introduction to Financial Management
Accounting	***MGMT 20000**	**Introductory Accounting (Required for MGMT Minor)**
	or	
	MGMT 20010	**Introductory Accounting for Non-MGMT Majors**
	MGMT 20100	Management Accounting I
Business Law	MGMT 45500	Legal Background for Business I
Economics	****ECON 21000**	**Principles of Economics**
	or	
	AGEC 21700	**Economics**
	ECON 25100	Microeconomics
	ECON 25200	Macroeconomics
Organizational Behavior and Human Resources	COM 32400	Introduction to Organizational Communication
	ENTR 20000	Introduction To Entrepreneurship And Innovation
	ENTR 31000	Marketing And Management For New Ventures
	OBHR 30000	Management of Human Resources
	OLS 37500	Training Methods
	OLS 37600	Human Resource Issues
	OLS 38600	Leadership for Organizational Change
	OLS 47700	Conflict Management
	PSY 27200	Introduction to Industrial Organizational Psychology

The above selectives may be replaced by a planned alternate sequence of Business & Economics selectives which reflect a subject of interest to which computing can be applied. Proposals for special options must be submitted in writing to Professor Jeffrey Brewer jbrewer@purdue.edu.

[1] **ECET Selective I** - ECET 22400 (ECET 22400 replaces ECET 21400)

[2] **Statistics Selective**= STAT 22500, **STAT 30100**, STAT 50100, STAT 51100

[3] **Physics Selective I = PHYS 21800**, PHYS 22000

[4] **Physics Selective II = PHYS 21900**, PHYS 22100

[5] **Professional Speaking Selective** = COM 31500, COM 32000, COM 32500, COM 41500

[6] **Professional Writing Selective** = ENGL 42000, ENGL 42100

[7] **Information Systems Selective =**
CNIT 30000 level and higher courses not required as a NET selective. (NO NET courses will fulfill the Information Systems Selective) CNIT 39900, 49900 and 58100 as approved by the NET faculty on a per offering basis or EPICS (EPCS): participation in EPICS requires CIT faculty approval for project content. Many EPICS projects require at least two semesters to earn 3 credits.

[8] NET Selective = CNIT 42000, CNIT 42100, CNIT 43500, CNIT 44500, CNIT 44600, CNIT 45600, CNIT 46000, CNIT 46100, CNIT 55600, CNIT 55700, IT 34500, IT 54500
CNIT 39900, 49900 and 58100 as approved by the NET faculty on a per offering basis.

[9] **Business & Economics Selectives: See above Business and Economics Selectives**

[10] **Communications Selective=**
COM 21000, COM 21200, COM 31400, COM 31500, COM 31800, COM 32000, COM 32400

[11] **Liberal Arts Selective =**
ANTH: AD: BAND: CLCS: COM: ECON: EDCI: EDPS: EDST: ENGL: FLL: HIST: HONR:
IDIS: LING: **MODERN LANGUAGES: MUS: PHIL: POL SCI: PSY: SOC: THTR:
HDFS 20100 or HDFS 25500 (HDFS previously CDFS)
MODERN LANGUAGES: ARAB, CHNS, FR, GER, ITAL, JPNS, PTGS, RUSS, SPAN

***Only one of the following: MGMT 20000 or MGMT 20010 can be taken for credit on the CIT plan of study.**
****Only one of the following: AGEC 21700 or ECON 21000 can be taken for credit on the CIT plan of study.**

Students must adhere to plan of study requirements in place at the time of admission.
Selective course choices are subject to change due to availability; current listings will be made available to students during registration.

Appendix L CIT Department Plan of Study Fall 2013

PURDUE UNIVERSITY

Department of Computer and Information Technology (CIT)
Suggested Arrangement of Required Courses
Effective Fall 2013

Phone Number_____ **Name**_____

Email Address_____ **ID**_____

FIRST SEMESTER	SUB/EQUIV	CR	GR	SEM	SECOND SEMESTER	SUB/EQUIV	CR	GR	SEM
CNIT 18000 (Intro to Systems Development) Prereq: PC Literacy		3			CNIT 15500 (Intro to Object-Oriented Programming) Prereq: PC Literacy		3		
ENGL 10600 or ENGL 10800* (First Year Composition or Accelerated First Year Composition)		3-4			CNIT 17600 (Info Tech Architectures)		3		
IT 10400 (Industrial Organization) Business Selective		3			CCM 11400 (Fund of Speech Communication)*		3		
MA 22300 (Intro Analysis I)* Prereq: ALEKS Score of 65%+		3			MA 22400 (Intro Analysis II)* Prereq: MA 22300 with grade C- or better		3		
TECH 12000 (Design Thinking in Technology) * Prereq: COT Major		3			OLS 25200 (Human Relations in Organizations)		3		
TOTAL CREDIT HOURS		**15**			**TOTAL CREDIT HOURS**		**15**		

THIRD SEMESTER	SUB/EQUIV	CR	GR	SEM	FOURTH SEMESTER	SUB/EQUIV	CR	GR	SEM
CNIT 25500 (Programming for the Internet) Prereq: CNIT 15500		3			CNIT 24200 (System Administration) Prereq: CNIT 17600 and Classification 3+		3		
CNIT 27200 (Database Fundamentals) Prereq: CNIT 15500 & CNIT 18000		3			CNIT 28000 (Systems Analysis & Design Methods) Prereq: CNIT 18000 & CNIT 27200		3		
Communications Selective[1]		3			Accounting Selective[4]		3		
Economics Selective[2]		3			Statistics Selective[5]		3		
Science Selective*[3]		3			Lab Science Selective*[6]		3		
TOTAL CREDIT HOURS		**15**			**TOTAL CREDIT HOURS**		**15**		

FIFTH SEMESTER	SUB/EQUIV	CR	GR	SEM	SIXTH SEMESTER	SUB/EQUIV	CR	GR	SEM
CIT Cognate Selective[7]		3			Information Systems Selective[10]		3		
CIT Cognate Selective[7]		3			Information Systems Selective[10]		3		
Programming Selective (CNIT 31500 or CNIT 32500) Prereq: CNIT 25500		3			Professional Writing Selective[11]		3		
Professional Speaking Selective[8]		3			Interdisciplinary Selective[9]		3		
Interdisciplinary Selective[9]		3			Global and Professional Issues Selective[12]		3		
TOTAL CREDIT HOURS		**15**			**TOTAL CREDIT HOURS**		**15**		

SEVENTH SEMESTER	SUB/EQUIV	CR	GR	SEM	EIGHTH SEMESTER	SUB/EQUIV	CR	GR	SEM
Free Elective[13]		3			CNIT 48000 (Managing Info Tech Projects) Prereq: CNIT 28000 & SR STANDING		3		
Interdisciplinary Selective[9]		3			Information Systems Selective[10]		3		
Information Systems Selective[10]		3			Interdisciplinary Selective[9]		3		
Information Systems Selective[10]		3			Interdisciplinary Selective[9]		3		
Humanities Foundational Selective*[14]		3			Behavioral/Social Sciences Foundational Selective*[15]		3		
TOTAL CREDIT HOURS		**15**			**TOTAL CREDIT HOURS**		**15**		

*Fulfills University Core

120 Total

1) Students must earn a C- or better in all CNIT courses that are a prerequisite to CNIT courses.
2) 120 semester credits listed above are required for the CIT Bachelor of Science degree.
3) 2.0 Graduation GPA required for Bachelor of Science degree.
4) 2.0 Graduation GPA in all CNIT courses required for Bachelor of Science degree.
5) CNIT COURSES MAY BE TAKEN NO MORE THAN THREE TIMES (INCLUSIVE OF W, WF or WN, I AND IF GRADES): STUDENTS NOT FULFILLING THIS POLICY MUST WITHDRAW FROM THE PROGRAM.
6) ANY COURSE TAKEN AT PURDUE CAN BE ATTEMPTED NO MORE THAN THREE TIMES (INCLUSIVE OF W, WF, WN, I and IF).

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The student is ultimately responsible for knowing and completing all degree requirements.
myPurduePlan is knowledge source for specific requirements and completion.

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SEE REVERSE FOR CIT SUPPLEMENTAL INFORMATION

Updated 10/29/13

CIT SUPPLEMENTAL INFORMATION
All prerequisites Must Be Met

[1]COMMUNICATIONS SELECTIVE
COM 21000 Debating Public Issues
COM 21200 Approaches to the Study of Interpersonal Communication
COM 31400 Advanced Presentational Speaking
COM 31500 Speech Communication of Technical Information
COM 31800 Principles of Persuasion
COM 32000 Small Group Communication
COM 32400 Introduction to Organizational Communication

[2]ECONOMICS SELECTIVE
AGEC 21700 Economics or ECON 21000 Principles of Economics, ECON 25100 Microeconomics, ECON 25200 Macroeconomics

[3]SCIENCE SELECTIVE &
[4]LAB SCIENCE SELECTIVE (must take at least 3 credits of Science Selective with a Lab Component)
See approved list at: http://www.purdue.edu/provost/initiatives/curriculum/course.html and check schedule of classes to ensure the course is being offered with a lab component.
The following courses are typically offered with a lab component:

BIOL 11000 Fundamentals of Biology I*
BIOL 11000 Fundamentals of Biology II*
BIOL 13500 First Year Biology Lab*
BIOL 14501 First Year Biology Laboratory with Neuro Research Project*
BIOL 14502 First Year Biology Laboratory with Micro Research Project*
BIOL 14600 Introduction to Biology*
BIOL 20300 Human Anatomy and Physiology*
BIOL 20400 Human Anatomy and Physiology*
BIOL 20500 Biology for Elementary Teachers*
BIOL 20600 Biology for Elementary Teachers*
BTNY 11000 Introduction to Plant Science*
CHM 11100 General Chemistry*
CHM 11200 General Chemistry*
CHM 11500 General Chemistry*
CHM 11600 General Chemistry*
CHM 12500 Introduction to Chemistry I*
CHM 12600 Introduction to Chemistry II*
CHM 13600 General Chemistry Honors*
CHM 20000 Fundamentals of Chemistry*
CHM 12901 General Chemistry with Biology Focus*
EAPS 10200 Earth Science for Elementary Education*
EAPS 10900 The Dynamic Earth*
HORT 10100 Fundamentals of Horticulture*
PHYS 17200 Modern Mechanics*
PHYS 21800 General Physics I*
PHYS 21900 General Physics II*
PHYS 22000 General Physics*
PHYS 22100 General Physics*
PHYS 27200 Electric and Magnetic Interactions*

[4]ACCOUNTING SELECTIVE
MGMT 20000 Introductory Accounting (Required for MGMT Minor)
MGMT 20010 Introductory Accounting for Non-Management Majors

[5]STATISTICS SELECTIVE
STAT 22500 Introduction to Probability Model
STAT 30100 Elementary Statistical Methods
STAT 50100 Experimental Statistics I
STAT 51100 Statistical Methods

[7]CIT COGNATE SELECTIVE OPTIONS (6 CREDITS):
OPTION 1:
CNIT 37200 Database Programming (prereq CNIT 27200) or CNIT 39200 (prereq CNIT 27200) Enterprise Data Management and
CNIT 38000 Requirements Discovery & Modeling (prereq CNIT 28000)
OPTION 2: (Required for NET concentration)
CNIT 34500 Internetwork Design and Implementation (prereqs CNIT 24000 & 24200 & concurrent prereq ECET 37400) and
CNIT 45500 Network Security (prereqs CNIT 34200 & CNIT 34500)

[8]Professional Speaking Selective
COM 31500 Speech Communication of Technical Information
COM 32000 Small Group Communication
COM 32500 Interviewing: Principles and Practice
COM 41500 Discussion of Technical Problems

[9]Interdisciplinary Selectives (15 credits) (*Course options will be continually updated and concentrations added to the CIT Website)*
Any University recognized minor with at least 15 credits will fulfill this requirement.
http://www.purdue.edu/advisors/courses_majors/minors.html

COM 32400 Introduction to Organizational Communication
ECET 22400 Electronic Systems
ECET 37400 Digital Telecommunications
ENTR 20000 Introduction to Entrepreneurship and Innovation
ENTR 31000 Marketing and Management for New Ventures
IET 45100 Monetary Analysis for Industrial Decisions
IT 34200 Introduction to Statistical Quality
IT 34500 Automatic Identification and Data Capture
IT 45000 Production Cost Analysis
MET 45100 Manufacturing Quality Control
MFET 24300 Automated Manufacturing I
MFET 40000 Computer-Integrated Manufacturing
MFET 45100 Manufacturing Quality Control
MGMT 20100 Management Accounting I
MGMT 30400Introduction to Financial Management
MGMT 32300 Introduction to Marketing Analysis
MGMT 45500 Legal Background for Business I
OBHR 30000 Management of Human Resources
OLS 37500 Training Methods
OLS 37600 Human Resource Issues
OLS 38600 Leadership for Organizational Change & Innovation
OLS 47700 Conflict Management
OLS 48400 Leadership Strategies for Quality and Productivity
PSY 27200 Introduction to Industrial Organizational Psychology

[10]INFORMATION SYSTEMS SELECTIVE
Any non-required 30000 level or higher CNIT course or EPICS (EPCS): participation in EPICS requires CIT faculty approval; CGT courses 30000 level or higher

[11]PROFESSIONAL WRITING SELECTIVE
ENGL 42000 Business Writing or ENGL 42100 Technical Writing

[12]GLOBAL AND PROFESSIONAL ISSUES SELECTIVE
TECH 33000 Technology and the Global Society (prereq TECH 120), other courses to be determined

[13]FREE ELECTIVE: Any non-remedial course: see *https://tech.purdue.edu/sites/default/files/files/NoCreditCourses-2013.pdf*
[14]HUMANITIES FOUNDATIONAL SELECTIVE: see *http://www.purdue.edu/provost/initiatives/curriculum/course.html*
[15]BEHAVIORAL/SOCIAL SCIENCES FOUNDATIONAL SELECTIVE: see
http://www.purdue.edu/provost/initiatives/curriculum/course.html

Effective Fall 2013 Updated 10/29/13

Appendix M Proposed Business Analyst Concentration Plan of Study and Course Descriptions

FIRST SEMESTER		SECOND SEMESTER	
COURSE REQUIREMENT	CREDIT	COURSE REQUIREMENT	CREDIT
CIT 180	3	CIT 176	3
ENGL 106	4	COM 114	3
MA 223	3	MA 224	3
IT 104	3	OLS 252	3
TECH 120	3	MGMT 175	3
TOTAL CREDIT HOURS	16	TOTAL CREDIT HOURS	15

THIRD SEMESTER		FOURTH SEMESTER	
COURSE REQUIREMENT	CREDIT	COURSE REQUIREMENT	CREDIT
CIT 272	3	CIT 280	3
OLS 274	3	COM 375	3
COM 315	3	Accounting selective***	3
Economics selective***	3	Statistics selective***	3
Science selective***	3	Lab Science Selective***	3
TOTAL CREDIT HOURS	15	TOTAL CREDIT HOURS	15

FIFTH SEMESTER		SIXTH SEMESTER	
COURSE REQUIREMENT	CREDIT	COURSE REQUIREMENT	CREDIT
CIT 380	3	CIT 321	3
CIT 551 Equivalent*	3	CIT 38301	3
MGMT 382	3	Requirements Management Processes Equivalent**	3

OLS 346	3	Professional Writing Selective***	3
Information Systems Selective***	3	Information Systems Selective***	3
TOTAL CREDIT HOURS	15	TOTAL CREDIT HOURS	15

SEVENTH SEMESTER		EIGHTH SEMESTER	
COURSE REQUIREMENT	CREDIT	COURSE REQUIREMENT	CREDIT
CIT 480	3	CIT 550 Equivalent*	3
CIT 405	3	Business Process Change Management Equivalent*	3
Free Elective***	3	Humanities Foundation Selective***	3
Interdisciplinary Selective***	3	Behavioral/Social Sciences Foundational Selective***	3
Information Systems Selective***	3	Information Systems Selective***	3
TOTAL CREDIT HOURS	15	TOTAL CREDIT HOURS	15

*refers to current CIT graduate courses. Equivalent versions of these courses would have to be developed in adherence to university policy

**refers to course currently a part of the online ProSTAR MS in Computer and Information Technology with an area of interest in IT Project Management

***refers to a selective course whose detailed information can be found in Appendix L

The following course descriptions were obtained from the Purdue University Fall 2013 Catalog and CIT department website:

<u>MGMT 175 – Information Strategies for Management</u>

Designed to build and sharpen students' information-gathering skills. Guides students in developing systematic methods for finding, evaluating, and presenting information. Organization and use of electronic and print tools will be explained through discussion, hands-on exercises, and homework assignments. Permission of instructor required (Purdue University, 2013)

MGMT 382 – Management Information Systems
This case-oriented course is designed to familiarize students with existing and emerging technologies and their business applications. It also covers issues, problems, and opportunities that information systems (IS) executives and general managers face when managing IS resources in their organizations. Includes lectures, presentations, case analyses and discussions, and a World Wide Web project. Case discussions cover real situations and deal with the operational and strategic decisions that every IS manager has to make in managing and exploiting the available information technology. (Purdue University, 2013)

OLS 252 – Human Relations in Organizations
A survey of the concepts that provide a foundation for the understanding of individual and group behavior in organizations. Special emphasis on typical interpersonal and leadership relationships. (Purdue University, 2013)

OLS 274 – Applied Leadership
Introduction to applied leadership in the context of organizational functions, structures, and operation. (Purdue University, 2013)

OLS 346 – Critical Thinking and Ethics
A course in complex problem solving and creative thinking with an emphasis on the ethical impacts of these solutions. (Purdue University, 2013)

IT 104 – Industrial Organization
A detailed survey of organizational structures, operational, financial, marketing, and accounting activities; duties of management, planning, control, personnel, safety, wages, policy, and human factors necessary for effective management. (Purdue University, 2013)

COM 315 – Speech Communication of Technical Information
The organization and presentation of information of a practical technical nature. Emphasis is placed upon the study, preparation, and use of audiovisual materials in such presentations. (Purdue University, 2013)

COM 375 – Conflict and Negotiation
This course surveys theory and research focused on the role of communication in conflict and negotiation, and helps students develop skills needed to manage conflict effectively in their personal and professional relationships. (Purdue University, 2013)

TECH 120 – Design Thinking in Technology
Student will engage in critical analysis of real-world problems and global challenges. They will demonstrate the ability to recognize opportunity and to take initiative in developing solutions applying the principles of human centered design. Students will be

able to communicate effectively and to work well on teams. Problems and solutions will be examined from societal, cultural, and ethical perspectives. (Purdue University, 2013)

CNIT 155 Introduction to Object-Oriented Programming
This course introduces fundamental software development concepts common to most programming languages. Topics include: problem solving and algorithm development, debugging, programming standards, variable, data types, operators, decisions, repetitive structures, modularity, array, user interface construction, software testing and debugging. A broad range of examples will be used throughout the course to show how each programming concept applies to real life problems. (Purdue University, 2013)

CNIT 175 Visual Programming
This course introduces event-driven application development and programming using a visual programming environment. Topics include problem solving and program design, control structures, objects and events, user interface construction, documentation, and program testing. (Purdue University, 2013)

CNIT 176 Information Technology Architectures
A conceptual and technological survey of information technology architectures inclusive of operating systems, network operating systems, distributed systems architectures, and distributed application architectures. Interoperability between these architectural components is explored. Current technology and trends in each architectural element are reviewed. (Purdue University, 2013)

CNIT 180 Introduction to Systems Development
This course introduces information systems development. Topics include types of information systems, system development, database management systems, and problem solving. Students will read/create UML, ERD, and data flow diagrams to model information system objects, data, processes, and logic. Labs emphasize modeling and SQL/QBE querying to prepare students for later systems, programming, and database classes. Given user requirements students will design, construct, and test a personal computer information system. (Purdue University, 2013)

CNIT 242 System Administration
This course provides a comprehensive introduction to system administration. Topics include authentication and authorization, directory services, system management and system security. Emphasis is placed on enterprise level systems. (Purdue University, 2013)

CNIT 272 Database Fundamentals
A study of relational database concepts. These concepts include data design, modeling, and normalization; the use of Structured Query Language (SQL) to define, manipulate, and test the database; programmatic access to a database and practical issues that database developers must handle. (Purdue University, 2013)

CNIT 280 Systems Analysis and Design Methods
Comprehensive introduction to information systems development. Topics include the systems analyst, the systems development life cycle, methodologies, development technology, systems planning, project management, systems analysis, systems design,

systems implementation, and systems support. Introduction to tools and techniques for systems development. (Purdue University, 2013)

CNIT 321 Enterprise Social Media and Global Information Technology
This course focuses on enterprise social media and global information technology. Topics include social media software applications such as communication, collaboration, multimedia and entertainment software, globalization, global information technology issues, cultural differences, understanding the role of culture and communicating across cultures. An emphasis will be placed on how companies are integrating enterprise social media applications and the impact of these technologies on the globalization of information technology. (Purdue University, 2013)

CNIT 380 Advanced Analysis and Design
This course is an advanced study of system analysis and design methods and techniques used by systems analysts to develop information systems. Object-oriented tools and the Unified Modeling Language (UML) will be used for describing object structure and behavior, and use cases will be used for modeling functional processes. Topics include rapid development concepts, application architecture and system design, transition from object-oriented analysis and models to components and services, graphical user interface design, web interface design, prototyping, and commercial software package integration. Emphasis is also placed on the use of an object-oriented CASE tool. This course surveys other important skills for the systems analyst, such as fact-finding (requirements discovery), communications, project management, and cost-benefit analysis.

CNIT 38301 Packaged Application Software
N/A

CNIT 399ISV Software as a Business
N/A

CNIT Software Development Methodologies
This course explores methodologies and practices commonly used in contemporary software development projects. Topics include programming standards, code ownership and accountability, source code management and version control, productivity and quality metrics, software testing, and software process maturity models. (Purdue University, 2013)

CNIT 480 Managing Information Technology Projects
This course introduces the application of knowledge, skills, tools, and techniques that project managers use to plan, staff, estimate, and manage information technology projects. Special emphasis is placed on learning and applying the concepts of managing scope, risk, budget, time, expectations, quality, people, communications, procurement, and externally provided services. Students will apply project management technology and techniques to business problems. (Purdue University, 2013)

CNIT 487 Database Administration
This course explores tools and techniques for managing an organization's database technology. Topics include database architecture, database technology installation,

database creation and maintenance, Database Management System (DBMS) operation and troubleshooting, and database performance tuning. In the laboratory, students engage in activities performed by a typical database administrator. (Purdue University, 2013)

CNIT 488 Data Warehousing
The design and implementation of data warehouses (including data marts and operational data stores) are studied using current database technologies. Topics include data modeling for warehouses, data warehousing infrastructure and tool selection, data exploration, data synthesis and reduction, organizational metadata, data warehouse administration, and other contemporary issues. (Purdue University, 2013)

*Business Process Change Management
N/A

**Requirements Management Processes
Explore the requirements management lifecycle. Develop abilities to elicit and document user requirements in a manner to assure project success. Understand the processes of requirements validation, verification and traceability. Develop a knowledge of requirements management tools for effective use. (“Plan of study,” n.d.)

*CNIT 550 Organizational Impact of Technology
An enterprise view of the organizational impact of information technology as the most effective means for achieving "better, faster, cheaper operations" in today's highly competitive business environment. Examines how information technology has enabled new organizational forms and changes in business processes, products, markets, delivery systems, ways of working, and people management issues and challenges. (Purdue University, 2013)

*CNIT 551 Information Technology Economics
Examines the economics of information systems and information technology as it relates to business performance. Topics include strategic information technology planning, alignment with business planning, value assessment, and performance measurement. Special emphasis is placed on issues relevant to strategic information technology infrastructure management, both for the information technology unit as well as the business as a whole. (Purdue University, 2013)